NASA CONTRACTOR REPORT CR-166537

DEVELOPMENT AND VALIDATION OF A SIMULATION FOR A GENERIC TILT-ROTOR AIRCRAFT

SAMUEL W. FERGUSON

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SAMUEL W. FERGUSON

Systems Technology, Inc.
Mountain View, California

Prepared For
Ames Research Center
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National Aeronautics and
Space Administration

Ames Research Center
Moffett Field, California 94035

SYSTEMS TECHNOLOGY, INC.

2672 BAYSHORE PARKWAY, SUITE 505 • MOUNTAIN VIEW, CALIFORNIA 94043-1011 • PHONE (415) 961-4674
FAX (415) 962-8121

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ABSTRACT

The effective use of rotorcraft simulation as a design tool is exemplified by the XV-15 Tilt-Rotor Research Aircraft program. From inception through issuance of the request for proposal and throughout the program design and flight test phases, simulation has complemented all aspects of XV-15 development. More than ten simulation periods have provided design guidance and pilot training in the areas of control concepts, cockpit configuration, handling qualities, pilot workload, failure effects, recovery procedures, and flight boundary problems and procedures. During 1983 at NASA Ames Research Center (ARC), approximately five months were devoted to developing and validating a generic tilt-rotor simulation (GTRS) using the XV-15 flight test data base as a validation benchmark. Numerous civil and military tilt-rotor design concepts and issues were evaluated by researchers from the government and private industry. This work has aided in providing a technology base for the civil certification of tilt rotors and for the Joint Services Advanced Vertical Lift Aircraft (JVX) program (subsequently designated the Bell-Boeing MV-22). Results from this simulation effort, using the ARC Vertical Motion Simulator (VMS), covered a broad range of topics, including the importance of simulation fidelity and validation. Subsequent work, through 1988, has also been conducted to further improve the GTRS mathematical model and correlate the model with available flight test data. This report summarizes much of the efforts described above with particular emphasis on the lastest effort, the GTRS mathematical model and its correlation with flight test data.

FOREWORD

The author would like to thank all who participated in this simulation validation project for their hard work in helping to improve the state of the art in tilt-rotor simulation. Special thanks go to Mr. Gary Churchill, the Contract Monitor, who patiently guided the work and to the SYRE support personnel, Messrs. Steve Belsley, Mike Weinstein, and Russ Sansom, who modified the GTRS program and kept it running on the VMS day after day. Also, special thanks go to many people at Bell Helicopter Textron, particularly to Messrs. Roger Marr, Milt Schramm, and Matt Landry. Without their efforts in developing the XV-15 specific IFHC80 program and its associated documentation, as well as their useful suggestions over the last several years, the present version of GTRS would not have been possible.

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LIST OF ABBREVIATIONS

ARC	Ames Research Center
BHT	Bell Helicopter Textron
c.g.	Center of gravity
CGI	Computer-generated image
CSC	Computer Sciences Corporation
dB	Decibel
DEC	Digital Equipment Corporation
deg	Degree
FFT	Fast Fourier transform
fps	Feet per second
FSAA	Flight Simulator for Advanced Aircraft
ft	Feet
GTRS	Generic-tilt rotor simulation
Hz	Hertz
IGE	In-ground effect
in	Inch
JVX	Joint Services Advanced Vertical Lift Aircraft
kts	Knots
LHX	Light Helicopter Experimental
ms,msec	Millisecond
NASA	National Aeronautics and Space Administration
ND	Non-dimensional

LIST OF ABBREVIATIONS (CONCLUDED)

NOE	Nap of the earth
OGE	Out-of-ground effect
PIO	Pilot-induced oscillation
rad	Radians
RPM	Revolutions per minute
S/N	Serial number
SCAS	Stability and control augmentation system
sec	Seconds
SHP	Shaft horsepower
STI	Systems Technology, Inc.
STOL	Short takeoff and landing
TV	Television
V/STOL	Vertical/short takeoff and landing
VMS	Vertical Motion Simulator

LIST OF SYMBOLS

AR	Aspect ratio, ND
A_1, A_2	Rotor-induced power equation coefficients, ND
B	Tip loss, percent
b	Number of blades, ND
C_D	Coefficient of drag, ND
$C_{D_{PR}}$	Rotor profile drag coefficient, ND
C_L	Coefficient of lift, ND
C_p	Coefficient of power, ND
C_{p_o}	Coefficient of power at zero thrust, ND
C_T	Coefficients of thrust, ND
C_W	Coefficient of weight, ND
C_1, C_2	Pylon drag equation coefficients, ft^2
c	Rotor blade chord, ft
c_t	Chord of rotor blade tip, ft
DL	Wing download, lbs
D_{PYL}	Pylon drag, lbs
G	Induced power variation with rotor height, percent
G(s)	Second-order motion washout
h	Height of rotor above ground, gt
I	Inertia, slug-ft^2
I_N	Nacelle incidence (airplane = 0 deg), deg
K	High frequency motion drive gain, ND

K_1, K_2	Constants in the IGE pitching moment equation, ft
M_{CG}	Pitching moment about the c.g. due to ground effect, ft-lbs
ND	Non-dimensional
P/P_∞	Ratio of the induced power in-ground effect to the induced power out-of-ground effect, percent
P_{PR}	Profile power, SHP
p, q, r	Airframe body axis rotational velocities, deg/sec
q_F	Freestream dynamic pressure, lbs/ft^2
R	Rotor radius, ft
R_c	Blade root cutout, ft
S_w	Wing area, ft^2
s	Laplace operator, rad/sec
T_{TOTAL}	Total combined rotor thrust, lbs
V_c	Calibrated airspeed, ft/sec
V_T	True airspeed, ft/sec
α	Angle of attack, deg
α_R	Rotor angle of attack, rad
α_W	Wing angle of attack, deg
$\dot{\alpha}_{MAX}/\delta_{LONG}$	Control response, rad/sec/in
$\ddot{\alpha}_{MAX}/\delta_{LONG}$	Control sensitivity, rad/sec^2/in
ΔT	Time delay, sec
δ_o	Rotor blade drag coefficient

LIST OF SYMBOLS (CONCLUDED)

δ_1	Rotor blade drag coefficient, 1/rad
δ_2	Rotor blade drag coefficient, $1/rad^2$
ζ	Second-order system damping ratio, ND
η_H	Freestream dynamic pressure loss at the horizontal tail, percent
σ'	Air density divided by air density at sea level standard condition, ND
τ_a	Aileron effectiveness, ND
τ_e	Elevator effectiveness, ND
τ_r	Rudder effectiveness, ND
ϕ	Phase angle due to visual delay, deg
ω	Circular frequency, rad/sec
ω_n	Second-order system break frequency, rad/sec
l_{c0}	Constant in the IGE rolling moment equation, ft-lb/deg
l_{c1}	Constant in the IGE rolling moment equation, ft-lb/deg-ft
l_{c2}	Constant in the IGE rolling moment equation, $ft\text{-}lb/deg\text{-}ft^2$
l_{c3}	Constant in the IGE rolling moment equation, $ft\text{-}lb/deg\text{-}ft^3$
l_{c4}	Constant in the IGE rolling moment equation, sec/ft

SECTION I

INTRODUCTION

The XV-15 Tilt-Rotor Research Aircraft program is a joint NASA/Army/Navy program that was initiated in 1973 as a tilt-rotor V/STOL aircraft "proof-of-concept" and "technology demonstrator" program. Two aircraft were built by Bell Helicopter Textron (BHT) for which basic proof-of-concept flight testing was completed in September 1981. One of these aircraft is currently stationed at NASA Ames Research Center (ARC) for continuation of government flight testing to document aircraft flight characteristics. The second aircraft is being used by BHT to further contractor development of the tilt-rotor concept and for participation in military mission suitability demonstrations. Figure 1 presents a photograph of the XV-15 landing aboard ship in the helicopter mode of flight during a Navy mission suitability trial. Figure 2 presents the XV-15 in the airplane mode of flight.

The tilt-rotor concept is aerodynamically, dynamically, and mechanically complex. Therefore, when development of the XV-15 was initiated it was considered to be a high-risk V/STOL development program. As part of the risk reduction effort for the project, a comprehensive piloted simulation was developed for use in the XV-15 design, development, pilot training, and flight testing phases. Reference 1 provides an excellent discussion of the historical and technical aspects of the continuing tilt-rotor simulation development effort as it evolved from 1973 to 1981. During this period, the XV-15 simulation capability developed at NASA ARC became a highly efficient tool to help meet numerous XV-15 program objectives.

The requirement for a generic simulation capability, so that various tilt-rotor configurations could be simulated using the NASA ARC Vertical Motion Simulator (VMS), was identified in July 1982. The BHT-developed simulation

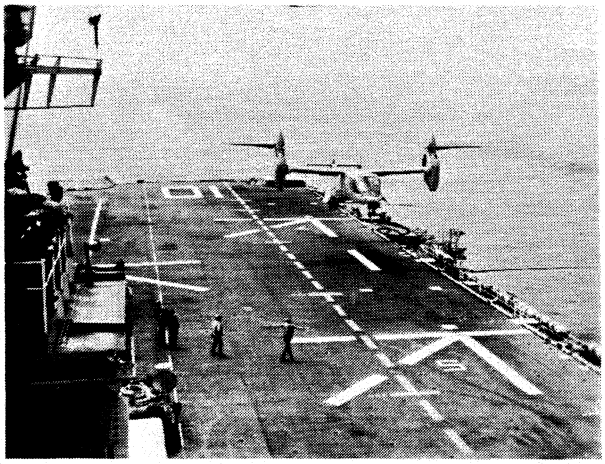


Figure 1. XV-15 in Helicopter Mode of Flight

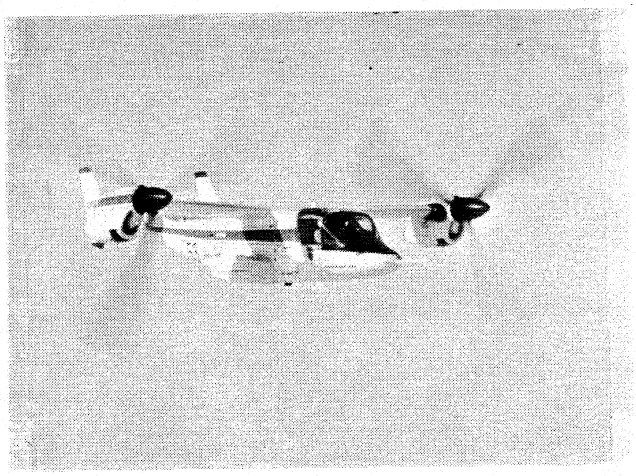


Figure 2. XV-15 in Airplane Mode of Flight

mathematical model of the XV-15 (Ref. 2), which had been used to that point in time with excellent results, was nevertheless configured specifically for the XV-15. Therefore, the mathematical model did not provide the flexibility required for generic tilt-rotor research. As a result, Systems Technology, Inc., (STI) was contracted by the NASA ARC XV-15 project office to develop a generic version of the BHT-developed XV-15 mathematical model. Initially, the tasks to be completed in the STI effort included: (1) restructuring the original BHT report (Ref. 2) by (a) updating the list of symbols, (b) restructuring the input/output format, (c) developing a cross reference between the VAX 11/780 and the Xerox Sigma 8 computer variable names and the generic tilt-rotor mathematical model report, and (d) modifying or improving the mathematical model in several deficient and, in general, minor areas; (2) programming, checkout, and validation of the generic tilt-rotor mathematical model; and (3) supporting simulation validation. This work culminated in the Generic Tilt-Rotor Simulation (GTRS) mathematical model described in Ref. 3.

A follow-on development effort, which has continued since Ref. 3 was published, has resulted in a significantly improved model. Many of the changes incorporated into this version of the GTRS mathematical model (Ref. 4) are a result of correlation with data from the continuing XV-15 flight test program.

The GTRS model has been developed into both a simulation version (for use on either the Sigma 8 or the CDC 7600 computers at NASA ARC) and an off-line version for use on computers running the Digital Equipment Corporation (DEC) VAX/VMS operating system (Ref. 5). The simulation version of the GTRS mathematical model was programmed originally by employees of Computer Sciences Corporation (CSC, now SYRE), a company under contract to NASA ARC for simulation support. STI developed the VAX version of the GTRS program through extensive modification of what was originally the BHT IFHC80 tilt-rotor simulation program. Development of this XV-15-specific software was started in 1971 under

a study contract that supported BHT's successful 1973 proposal for the XV-15, and it was revised to the final form described in Refs. 6 and 7 during performance of the XV-15 fabrication contract.

SECTION II

PROJECT OVERVIEW

The development and validation of the GTRS, under the guidance of the NASA ARC XV-15 project office, was conducted in two phases. Phase I lasted from approximately August 1982 to August 1984. The second phase began at the end of Phase I and continued until the Fall of 1988.

A. PHASE I

Four basic tasks were completed during the Phase I GTRS effort. The first task required definition and formatting of the existing XV-15 mathematical model into a structure providing the flexibility to simulate other tilt-rotor configurations, making the term "generic" applicable to the mathematical model. Following a paper definition of the mathematical model, the second task, implementation, was carried out on both the Sigma 8 and IFHC80 versions of the XV-15 software. Since the Sigma 8 version of the program was used to drive the simulation hardware, the majority of the conversion work was performed by CSC personnel under the direction of NASA and STI. The off-line VAX/VMS version of the BHT-developed program IFHC80 was modified by STI into the initial version of what is now known as GTRS. Documentation, using BHT-developed reports as examples for user's and programmer's guides (Refs. 6 and 7), were also developed. (Reference 5 is the latest version.) The mathematical model (Ref. 3) and software were reformatted into a modular structure, where each module is defined by:

1. A module or component name (i.e., rotor, fuselage)
2. A list of configuration-dependent inputs (i.e., dimensional data, aerodynamic data, mass/inertia data)
3. A list of state-variable or control inputs (i.e., control positions, velocities, angular rates)

4. A description and explanation of all module equations

5. A list of module outputs (i.e., forces, moments)

No imbedded configuration-related data were left in the new program but were, instead, used as inputs to the new program as constants or data tables.

The third task of Phase I involved correlation of the new generic mathematical model (in the XV-15 configuration) with available XV-15 flight test data. Much of the early effort associated with this task is discussed in Ref. 8. This work was continued in Phase II, and some of the results of the extended correlation effort are presented in later sections of this report.

The fourth task in Phase I required STI to provide technical support to NASA as requested. In executing this task, STI became involved in NASA's tilt-rotor simulation efforts, installation of GTRS at other government and contractor facilities, user training on the VAX/VMS version of the program, and miscellaneous involvement in other types of tilt-rotor research.

B. PHASE II

Following completion of Phase I, a list of GTRS program limitations and deficiencies was defined for NASA, and a request was made for additional flight test data to correlate with the XV-15 mathematical model. This list became the foundation of the Phase II effort, which included the following tasks:

1. Extensive (further) development of the maneuver options in the VAX/VMS version of GTRS (as originally developed in IFHC80)

2. Incorporation and checkout of a modular-structured S/N 703 SCAS and governor model

3. Incorporation and checkout of an RPM degree-of-freedom into all options of the VAX/VMS version of GTRS

4. Correlation of XV-15 flight test data with GTRS

5. Development of an acceleration stability derivative output format for the VAX/VMS version of GTRS

6. Review and expansion of the in-ground effect mathematical model

7. Incorporation of mast rate acceleration effects

8. Development of trim and maneuver time history output file formats for use with NASA-developed graphics programs and the TRENDS data base

9. Development of a Bode plot generation capability for the VAX/VMS version of GTRS using a sum-of-sines-driven control input [this capability is provided as a post-processing option so that any output variables from GTRS can be used to generate describing functions with a fast Fourier transform (FFT) technique]

10. Review of the aerodynamic data table interpolation routines and correction of identified discrepancies

11. Expansion of the trim sweep and namelist variable lists

12. Incorporation of failure logic as required to simulate certain critical system failures, i.e., SCAS, governor, engine

13. Support for various simulation experiments as requested by NASA for programs such as JVX, LHX, and the XV-15 Advanced Technology Blades

14. Installation, training, and miscellaneous GTRS support for NASA, other government agencies, and several government contractors

15. Revision of all Phase I documentation (mathematical model report and user's and programmer's guides)

16. Preparation of a final report.

The results of Phase II work are included as Revision A to the GTRS mathematical model report (Ref. 4) and the user's and programmer's guides (Ref. 5) where appropriate. Results from the correlation effort between the GTRS mathematical model and the XV-15 flight test data are presented in this report, beginning in Section IV. This work is preceded in the next section by an overview of simulation validation.

SECTION III

SIMULATION VALIDATION OVERVIEW

During Phase I of the project, a major NASA-sponsored simulation effort was conducted using the Vertical Motion Simulator (VMS). Seven major research areas were identified prior to the simulation that were considered important in developing and demonstrating a "complete" tilt-rotor research tool. These research areas included the:

- Mathematical model
- Visual system
- Motion system
- Cab aural system
- Cab control loader system
- Pilot perceptual fidelity
- Generic tilt-rotor applications (e.g., precision approach evaluation, certification criteria development).

Individual experimenters, from both the government and private industry, were assigned blocks of time for research in these specific areas in the top level of the simulation test plan. The ultimate goal of the test plan was to validate the tilt-rotor simulation and to establish a data base for the various components so that future research could be planned in a more efficient manner. The majority of results presented in this report apply to the mathematical model development and correlation effort. This effort was initiated during this simulation (as Phase I of the contract) and subsequently continued through to 1988 (as Phase II). Discussion of other topics will vary in detail depending

on STI's participation in that aspect of the research. Wherever possible, work by other investigators is referenced for further reading. However, before proceeding to our discussion of results, it is important to define several terms.

Mathematical models, as well as visual and motion simulator systems, must be developed and designed to provide appropriate fidelity in support of specific research, test, and training objectives. Historically, therefore, simulation efforts have relied heavily upon past engineering experience when selecting and designing hardware and software. Little other rationale has existed for relating simulation requirements to fidelity in terms of specific research, test, or training objectives. One hypothesis that can be put forth is that, if the simulator can induce "correct" piloting technique, then, presumably, simulation fidelity is adequate. Correct piloting technique is defined as that which is measured during actual flight testing while a pilot is performing the task of interest. A primary objective of the STI portion of the Phase I generic tilt-rotor simulation effort (and some of the Phase II work as well) was to make a quantitative assessment of simulator mathematical model fidelity requirements and to determine the effects of specific mathematical model deficiencies. Secondary objectives included the investigation with other researchers of some of the other components of the simulation.

In order to better understand the simulation validation effort described in this report, several definitions need to be introduced. *Validation* is the degree of demonstrated transferability of simulation performance results to the flight environment; it is demonstrated through *verification* and the quantification of *fidelity*. Verification (or engineering measurement fidelity) is the comparative assessment of the system (tilt rotor) as it is simulated and represented by its most realistic available model(s), and fidelity is the pilot's perception of the degree to which the states are present that are essential to producing correct psychomotor and cognitive behavior (i.e., piloting technique) for a given task and environment and the analytical corroboration of this perception by analysis of the pilot's performance of similar tasks in flight and in the simulator.

A researcher quantifies *validation* by providing an answer to the question, "How close does the simulation reproduce all of those features of flight that are essential to obtaining the desired (and correct) result?" Validation involves all aspects of the integrated rotorcraft simulation (mathematical model, cockpit and controls, motion, visual, and aural) and any approximations used should be uniformly valid across all of the components. The accuracy of the answer to this question is critical if the researcher expects to use the simulation results to quantify expected benefits prior to actual demonstration in flight. If a high degree of simulation validation is not demonstrated, the simulation results and demonstrated benefits may not be directly transferable and/or some conversion factor or "guesstimation" may be required when equating the simulated benefits to expected flight benefits.

Verification is quantified through a comparison of the tilt-rotor mathematical model(s) and the actual flight vehicle. Unfortunately, many researchers mislabel this task as the validation task and assume that the performance of the mathematical model is the only cornerstone to a successful simulation. Whenever possible, the tilt-rotor mathematical model(s) should be evaluated and the responses compared with the actual flight vehicle for both the mission tasks and the flight conditions to be simulated.

Fidelity is quantified by studying pilot behavior in both simulation and flight. Poor simulation fidelity may induce negative training by incorrectly teaching a piloting technique. This occurs through poor presentation of vehicle, visual, or motion characteristics that induce incorrect pilot psychomotor and cognitive behavior. Today, many examples exist of poor fidelity due to simulation technological limitations. For example, the U.S. Air Force has found it desirable to train pilots in air-to-air combat through the use of simulators *without* motion. This is because the required motion washouts during violent air-to-air combat maneuvers have been shown to induce negative pilot training.

The results and discussion that will be presented in the remainder of this report will be quantified in an attempt to fit within the above definitions and fulfill the associated requirements for establishing measures of simulation validation. The results, as presented in this format, should help to more clearly define the present state of the art in tilt-rotor simulation as well as help in making recommendations for future research.

SECTION IV

MATHEMATICAL MODEL DEVELOPMENT AND VERIFICATION

Several simulation deficiencies and mathematical model limitations were already known to exist prior to the Phase I simulation effort or were discovered during the early part of the simulation. Subsequently, modifications were made to the GTRS mathematical model in an effort to correct these deficiencies/limitations; however, the scope of some of the modifications were in excess of what could be accomplished during the limited time frame. After the Phase I simulation, each of the deficient mathematical model features or capabilities was reviewed and developed further during the Phase II portion of the contract. As a result, a majority of the important GTRS deficiencies/limitations no longer exist or their adverse impact has been reduced. Results presented in this section are intended to document the GTRS mathematical model as it has been verified by or correlated with XV-15 flight test data (using Revision A of the mathematical model). Results are presented in a systematic manner, beginning with hover and increasing in airspeed through the helicopter, conversion, and airplane modes of flight.

A. HOVER AND LOW SPEED

The hover and low-speed flight regime (Fig. 1) was the first to be investigated in the GTRS validation effort. The major deficiencies/limitations that were known prior to the Phase I simulation included:

- Hover performance prediction
- In-ground effect (IGE) rotor and airframe aerodynamic modeling
- Sideward flight
- Short takeoff and landing performance characteristics.

Each of these subject areas is discussed in greater detail in the following paragraphs.

1. **Hover Performance**

Hover performance does not need to be predicted as accurately for handling qualities or pilot-in-the-loop simulation purposes as it must be predicted in the evaluation of rotor design tradeoffs and the evaluation of detailed overall mission performance (for purposes such as guaranteeing performance). For simulation purposes, performance should be predicted accurately throughout the flight envelope to the extent that unrealistic flight conditions are not mistakenly evaluated as realistic and to ensure that the predicted results are accurate in the evaluation of recovery procedures for various failure modes (e.g., engine failure in hover). For this reason, it is important to note that, in hovering flight, the GTRS mathematical model is not, and should not be considered, a performance prediction program. The GTRS mathematical model, while it can be quite accurate in predicting hover and forward flight performance, works best when it is used in conjunction with much more complex performance prediction programs and with whirl-tower and/or wind-tunnel data. This result is due to the requirement that certain rotor data coefficients must be input as an overall average value for certain rotor or rotor blade characteristics (e.g., rotor blade average lift coefficient, C_l, and drag coefficient, C_D). Independent verifications of isolated rotor figure of merit and propeller efficiency are important in defining these coefficients.

Hover performance, as documented by numerous references, was considerably overpredicted in early versions of the BHT XV-15 simulation. Figure 3 presents a summary of isolated rotor performance data, as documented in Ref. 9, and Fig. 4 presents an updated summary of flight test hover performance data presented in its original form in Ref. 10 at a gross weight of approximately 13000 lb (C_W/rotor = 0.009). The original GTRS prediction for rotor power required for out-of-ground effect (OGE) hover was approximately 11 percent lower than flight test data. Upon further investigation, several sources were identified that

contributed to this deficiency, including: (1) the wing download model, (2) the in-ground-effect rotor model, and (3) several performance-related input data values for the rotor model that seemed optimistic. Modifications to the GTRS rotor model were subsequently made in each of these three deficient areas. Correlation with XV-15 flight test data using the improved mathematical models has yielded excellent results. It is important to note that airplane mode performance prediction accuracy was also improved, which would be expected if the modifications were made correctly.

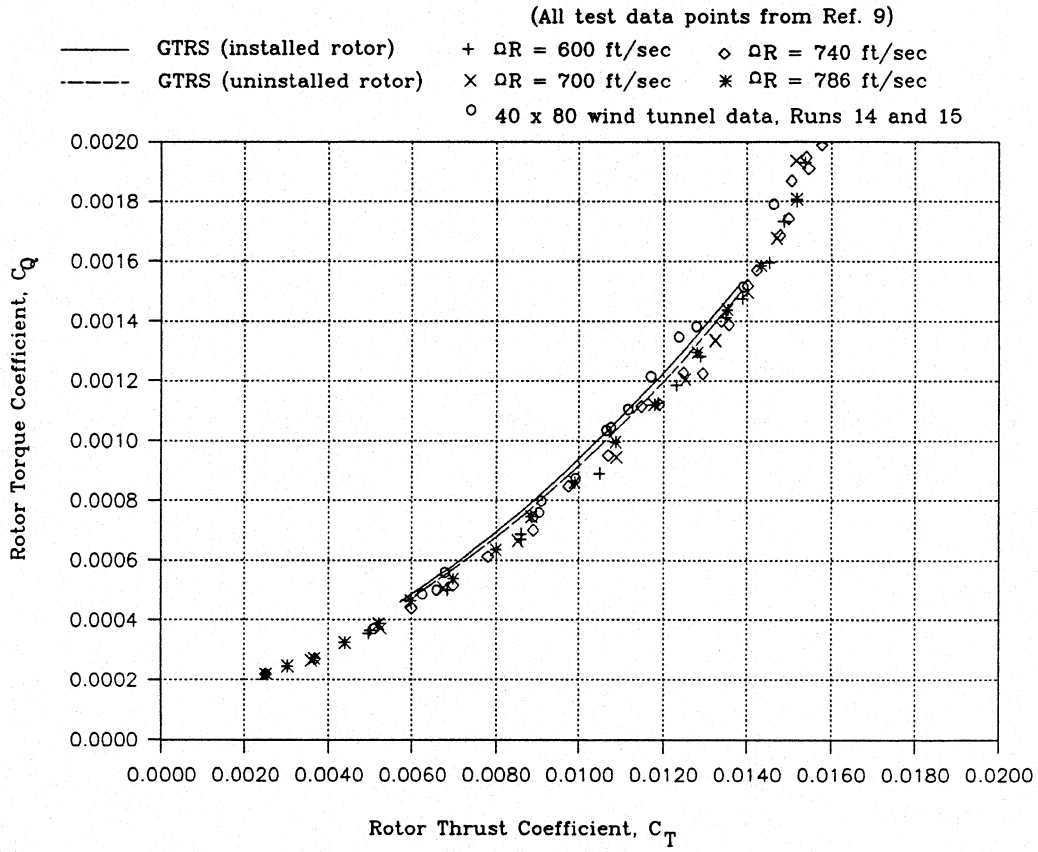


Figure 3. Correlation of XV-15 GTRS rotor with Wright-Patterson Test Stand and NASA ARC 40 × 80 Wind-Tunnel Hover Performance Data

Wind download was originally estimated for the XV-15 to be a value of approximately 7 percent. Since download results in a simple slope change in the

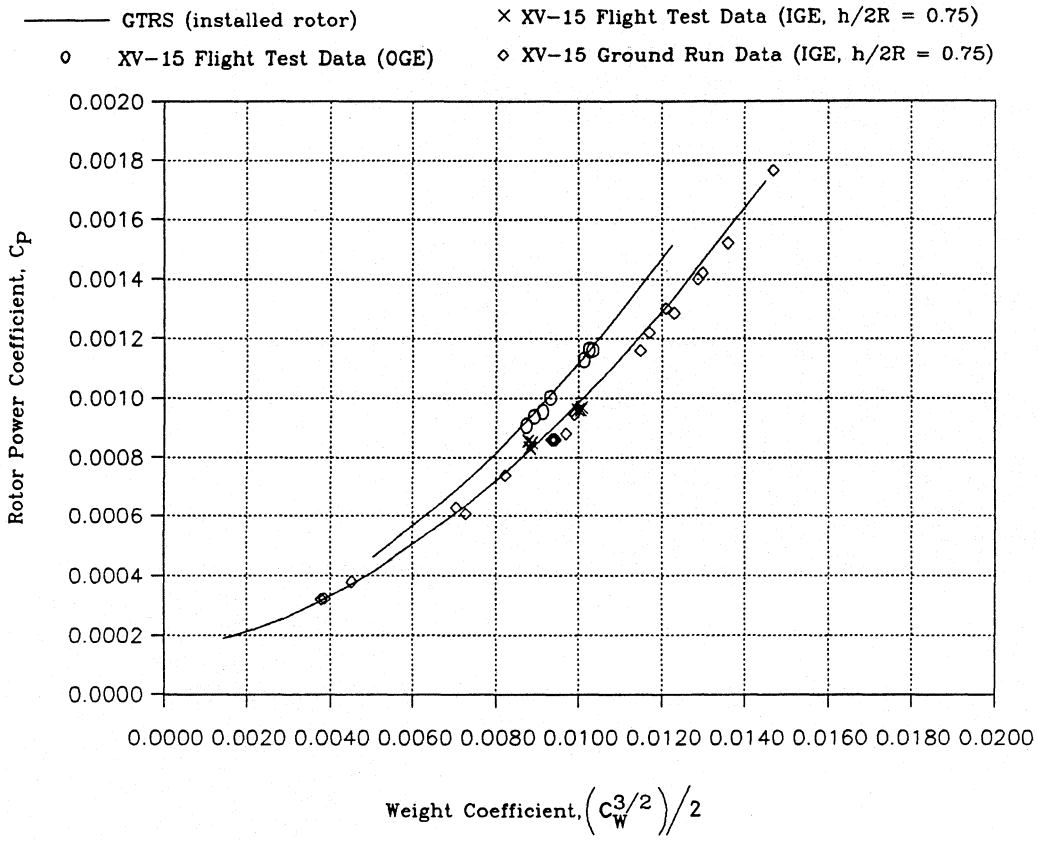


Figure 4. Correlation of XV-15/GTRS Flight and Tie-Down Stand Hover Performance Data

coefficient of power (C_p) versus coefficient of weight (C_W) relationship (C_{p_0} is independent of thrust and will remain constant), an analysis was conducted by evaluating flight test data using the following relationship:

$$\frac{(C_T)^{3/2}}{(C_W)^{3/2}} = \frac{1}{(1-DL)^{3/2}}$$

The flight test data analysis indicated that a more realistic value for XV-15 download was actually much closer to 13 percent. Subsequently, wind-tunnel and hover-test-stand investigations were conducted in an attempt to better understand why the value for XV-15 download is so large. Preliminary results from these tests verified the value measured in flight test (approximately

13 percent) and identified and demonstrated modifications to the XV-15 wing configuration that may be successful in reducing the download to a value closer to the original design value of approximately 7 percent. In the GTRS mathematical model, the correction for the wing download deficiency was implemented by increasing the values for the wing drag coefficient in the aerodynamic data tables in the region of wing angle of attack, α_W, equal to approximately -90 deg.

The IGE rotor mathematical model was also discovered to have a significant impact on the calculation of hover performance. The simple relationship originally incorporated in BHT's versions of the mathematical model resulted in numerous pilot complaints when the simulated XV-15 was hovered in close proximity to the ground. These pilot complaints generally centered around the observation that sudden instead of gradual collective motions were required when entering or exiting the mathematical model ground-effect boundaries [rotor height/rotor diameter or (h/2R) approximately equal to 2.0]. An exponential relationship similar to that developed by Hayden from a U.S. Army helicopter data base (Ref. 11) was subsequently developed for the XV-15 using the flight test data generated by Maisel in Ref. 10 for five values of h/2R. The exact form of the equation used for the GTRS model is:

$$G = 1 - A_1 e^{A_2(h/2R)}$$

where $A_1 = 1.5629$ and $A_2 = -2.9119$ were determined using a least-squares curve fit. Figure 5 presents the effect of the original and final ground-effect models on the calculation of power required in comparison with XV-15 flight test data for the parameter P/P_∞, which is an approximate measure of the induced power IGE to the induced power OGE (rotor profile power was included in the data). Subsequent use in the VMS of the improved ground-effect model has resulted in the elimination of pilot complaints.

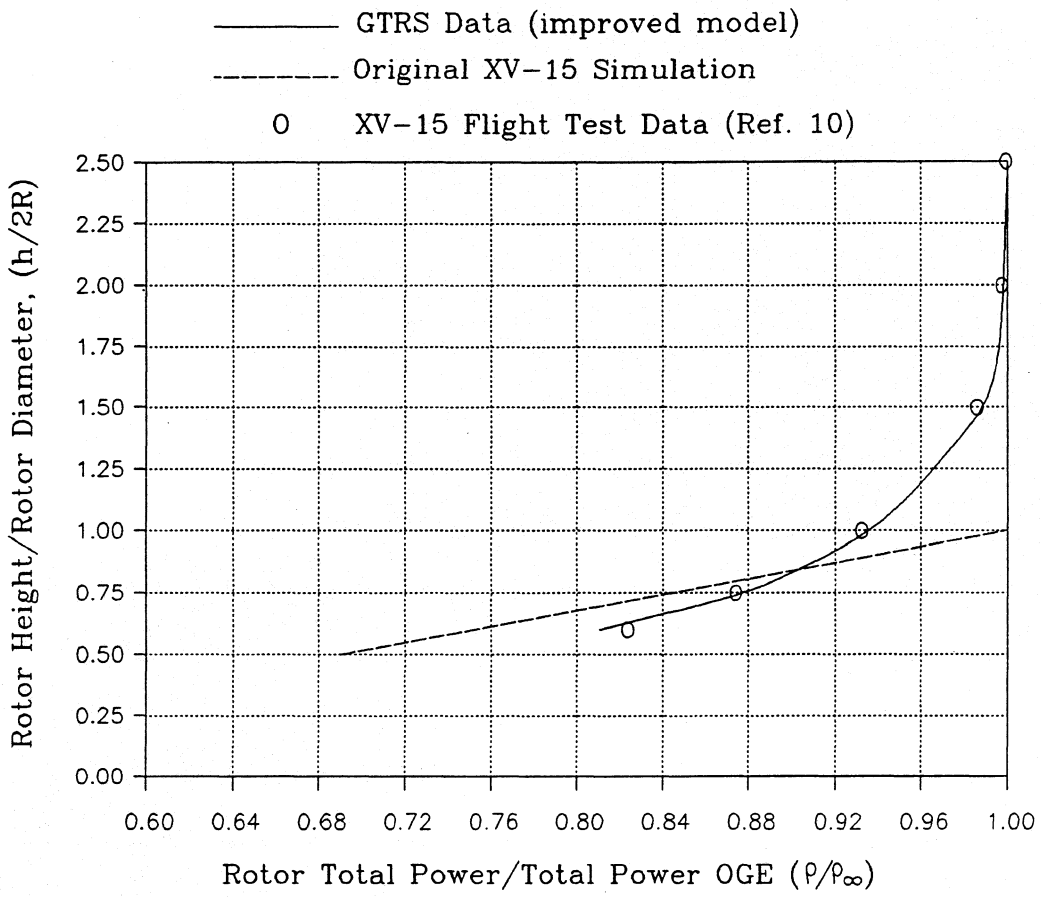


Figure 5. Effect of Ground Proximity on Hover Power Required

The final modifications required to improve the hover performance prediction capability of the GTRS mathematical model involved re-estimation of several rotor input data values. These modifications were made subsequent to the wing and ground-effect modifications so as to make up the difference between the predicted and measured rotor performance test data. The rotor input data values that were changed to correct the remaining discrepancy in hover power required were the coefficients in the rotor blade profile drag equation. The choice of these particular input data values was a *judgment* call for the sake of simplicity. These coefficients ($\delta_0, \delta_1, \delta_2$) are used in the profile drag equation, along with angle of attack, where:

$$C_d = \delta_0 + \delta_1 \alpha_R + \delta_2 \alpha_R^2$$

This equation is the same as that developed by Bailey (Ref. 12) and discussed by Gessow and Meyer in Ref. 13 (additional corrections are made to this equation for tip Mach number effects). The form of the equation assumes, among other things, that the coefficients are the average rotor blade drag coefficients and not the coefficients of a particular blade airfoil section (see Ref. 13 for a description of all of the rotor mathematical model assumptions, e.g., uniform induced velocity, average value for rotor blade lift curve slope). Rotor coefficient values presently used in GTRS for the XV-15 are $\delta_0 = 0.015$, $\delta_1 = -0.068$, and $\delta_2 = 0.81$.

Initially, it was believed that the values of δ required to simulate accurately the XV-15 rotor, especially δ_0, must be in error because of the large values required. In an effort to substantiate the values in the equation, several tasks were undertaken. The first task involved an analysis of XV-15 ground tie-down stand data. A second task, accomplished much later following the availability of new data, involved a review of isolated XV-15 rotor performance.

The analyzed tie-down stand data provided a measure of C_W from load cells that were located in wing tie-down attachments for a wide range of rotor blade collective pitch settings. These data are presented in Fig. 6. As can be seen, an extrapolation of the test data yields a C_{p_0} value of approximately 0.00014 to 0.00015 at flat pitch. It should be noted that flat pitch on the XV-15 does not really mean that lift is equal to zero out the blade span. Instead, with the -40.9 degree blade twist from hub to tip, significant portions of the rotor blade are producing positive or negative lift that, instead, cancel out to produce an overall value of rotor thrust equal to zero. Assuming a value for C_{p_0} equal to 0.00015, the calculated value for profile power at flat pitch (589 RPM) is approximately 145 SHP. This calculation can be compared with a simple

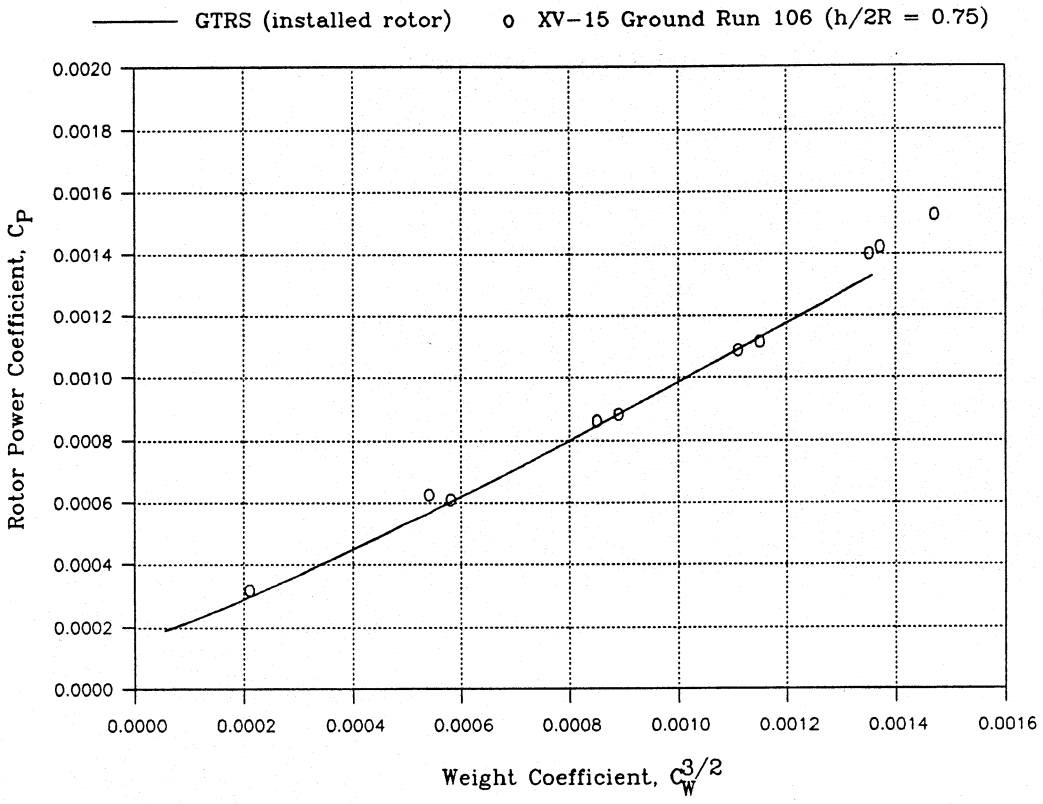


Figure 6. Correlation of XV-15/GTRS Hover Tie-Down Stand Data

calculation for profile power using the following blade element theory formula, where a coefficient of profile drag ($C_{D_{pr}}$) of 0.015 is used (assuming a 10 percent blade root cutout due to the spinner):

$$P_{pr} = \frac{(\sigma')(C_{D_{pr}})[b(R-R_c)c]RPM^3R^3}{1.61 \times 10^9}$$

The calculated value of profile drag resulting from this equation is approximately 147 SHP. Based on these calculations and a knowledge of the assumptions used in the formulation of the rotor theory, it is not unreasonable to assume that larger values for δ are required for a tilt rotor when compared to a helicopter (which has a much lower blade twist rate).

As stated earlier, the use of the increased values for δ was a *judgment call* for the sake of simplicity. One other rotor mathematical model input value that is unknown for the XV-15 is the correct value for tip loss, which is an artifact created by a rotor model that assumes uniform induced velocity. A value of 0.97 was originally used in the BHT XV-15 model (and still is). While for most helicopters this value is appropriate, for a tilt rotor, this value may be optimistic. Reference 13 provides for an approximation of tip loss (B) equal to:

$$B = 1 - \frac{c_t}{2R}$$

where c_t is the chord at the blade tip. For the XV-15, this calculation results in a tip loss value of 0.953. If this value is substituted into the GTRS rotor model, the resulting increase in power required to hover is approximately 20 SHP (which approximately equates to a reduction in δ_0 from 0.015 to 0.013.)

When the flight test and tie-down stand data presented in Figs. 4 and 6 were first reviewed and correlated with GTRS, a problem arose. Whenever the rotor input values were adjusted to correlate with actual flight test data, the predicted GTRS rotor performance was degraded in comparison to that measured and presented in Fig. 3. Only the 40 × 80 wind-tunnel data yields a thrust-power relationship similar to that predicted by GTRS (as matched to flight test data). Engineering personnel at Bell and NASA had been suspicious for years that these data, particularly the Wright-Patterson whirl stand data, were optimistic due to unknown reasons (or to unimplemented corrections to the test data). However, no proof was ever presented to show why the data were in error.

In mid-1984, NASA tested three different XV-15-sized rotor blade configurations in an effort to resolve this question and obtain performance data for advanced tilt-rotor configurations. The test utilized the Outdoor Aerodynamic Research Facility (OARF) at NASA Ames Research Center and the XV-15 metal blades, XV-15 Advanced Technology Blades (ATB), and a set of 0.658-scale

V-22 blades. The XV-15 metal blade data from this test are presented in Fig. 7 (from Ref. 14). When data from GTRS runs are plotted against the test data, it can be seen that GTRS still predicts a degraded isolated rotor performance capability. However, the discrepancy is less than that predicted in Fig. 3 in comparison to the Wright-Patterson data. Fortunately, during the OARF tests, an effort was made to evaluate the scaled V-22 blades in close proximity to a simulated wing while in the presence of an image plane (to simulate the other rotor). This testing revealed that, in the "installed" rotor configuration, there was a reduction in thrust for a specific value of power from 1.2 to 1.8 percent (Ref. 15). If this measured degradation in installed V-22 rotor performance is assumed applicable to GTRS predicted XV-15 rotor performance, then the dashed lines in Figs. 3 and 7 can be constructed. These lines are the installed GTRS rotor performance characteristics corrected to an "uninstalled" single-rotor configuration. As can be seen, this correction significantly reduces the observed discrepancy between isolated rotor test data and XV-15 flight test data.

In conclusion, the hover performance correlation effort for the GTRS rotor mathematical model has resulted in definition of a very believable set of XV-15 input data coefficients. The believability of the values for these coefficients reflects well on the appropriateness of the structure of the rotor mathematical model for simulation applications. The broad range of correlation, as shown in Figs. 3 through 7, indicates that the rotor mathematical model correlates very well with numerous independent sources of rotor performance data. The comparison with tie-down data in Fig. 6 is excellent except at very high values of C_W (at which the XV-15 does not operate). The comparison with flight test data in Fig. 4 for OGE hover and IGE hover at an 18.5-ft rotor hub height is also very good. This correlation is also well justified in light of the OARF test results on rotor-installed power versus uninstalled power. Further discussion on the effect of these modifications on forward flight performance will be presented in a subsequent section.

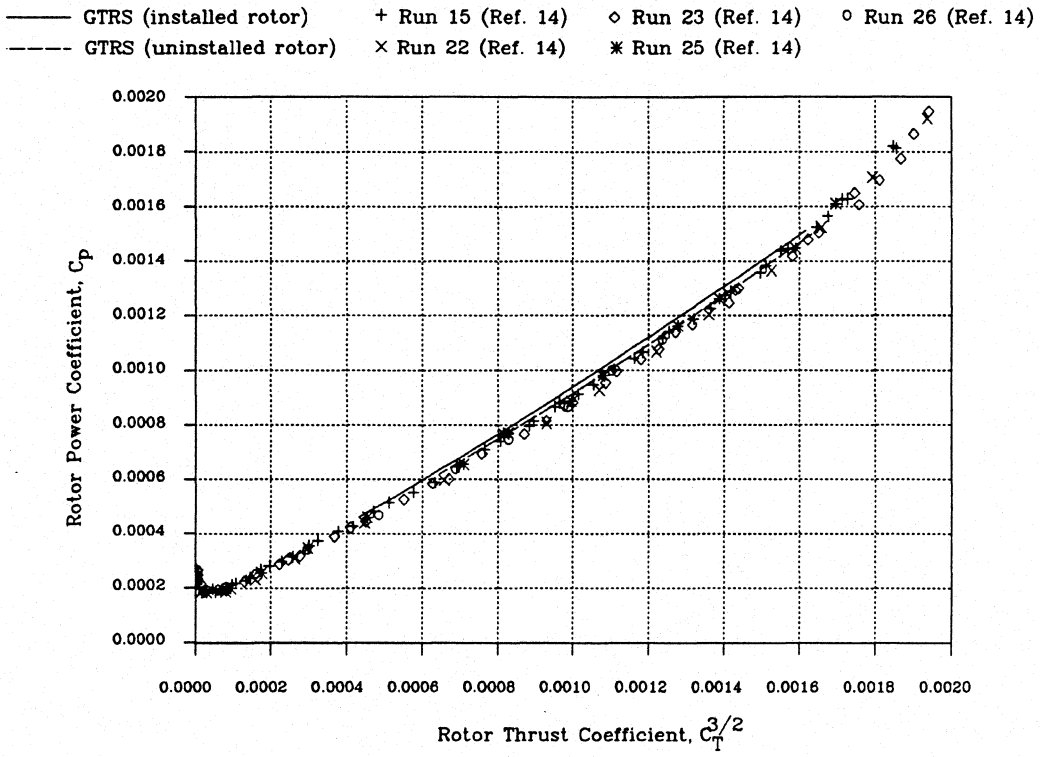


Figure 7. Correlation of XV-15 Metal Rotor Blade OARF Test Data with GTRS

2. In-Ground Effect Rotor and Airframe Aerodynamic Modeling

The quality of simulation fidelity can often be enhanced significantly from a pilot's point of view when certain small and unique characteristics are included. Two ground-effect characteristics of the XV-15 that have been observed in flight test fit into this category. These include a requirement for aft longitudinal stick trim when entering ground effect and a roll instability in ground effect. Neither of these effects is predicted by the GTRS mathematical model due to their interactional aerodynamic nature; therefore, these effects had to be included empirically in the mathematical model in order to improve simulation fidelity.

The aft longitudinal stick trim effect was documented from flight test data in Refs. 10 and 16. These data are reproduced in Fig. 8.

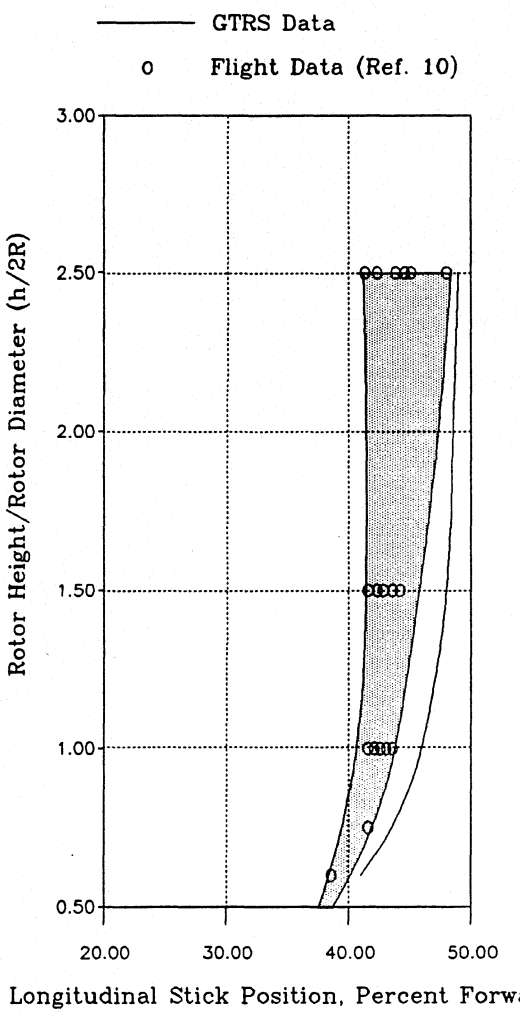


Figure 8. The Effect of Hover Height on Longitudinal Stick Position

The hypothesized cause for this effect assumes that the rotor downwash is reflected from the ground at the juncture of the two rotor wakes (the "fountain effect") and subsequently impinges on the bottom side of the aft fuselage and horizontal tail, thereby creating a nose-down pitching moment. Therefore, the

empirical model chosen to simulate this effect needed to be a function of both rotor thrust and rotor hub height above the ground. The model that was subsequently used to meet this requirement is:

$$M_{CG} = K_1(T_{TOTAL})e^{(-h/2R)(K_2)}$$

Results using this model, also presented in Fig. 8, provided the simulation fidelity desired by the pilots. As the XV-15 descended in hover from OGE to touchdown, the trimmed longitudinal stick position shifted aft by approximately 8 percent. The aerodynamic force required to produce a moment of this magnitude, if it is assumed that the force is applied at the quarter chord of the horizontal tail, is approximately 130 lbs at an h/D of 0.6, and it decreases to approximately 50 lbs at an h/D of 1.0. These values of force appear quite reasonable when considering the size of the surface area of the XV-15 aft fuselage and horizontal tail and the strong upwash environment that is involved. During early flight testing of the XV-15, pilots also reported a "suckdown" effect when coming into ground effect at a low forward airspeed. This resulted from a nose-down pitching moment that appeared as negative g's at the pilot's location. After implementing the empirical model described above in the simulation, the pilots reported this suckdown tendency, thereby providing further fidelity credibility to the simulation.

The roll instability encountered in ground effect was first quantified by BHT from model tests of the XV-15. An analytical representation for this effect, which is a function of the hub height, is:

$$l_C = \left[l_{C0} + l_{C1}\left(\frac{h_H}{2R}\right) + l_{C2}\left(\frac{h_H}{2R}\right) + l_{C3}\left(\frac{h_H}{2R}\right)^3 \right] \underbrace{[e^{l_{C4}V_T}]}_{\text{added lag}}$$

where $l_{C0\text{-}C3}$ are constants. This effect is also a "fountain effect," but the roll instability is caused by lateral motion of the fountain due to roll angle, differential thrust, or lateral velocity. For the simulation validation effort, this effect was further modified analytically in order to include a lag. While

the introduction of the lag definitely increased the fidelity of the effect, the pilot comments indicated that the simulated instability was too small in amplitude and that it occurred at too low a frequency. Further study of this effect will therefore have to be made.

3. Low-Speed Flight

XV-15 sideward flight characteristics, as simulated by the GTRS model, were also identified as a significant deficiency during the 1983 simulation. Documentation of this deficiency is provided in Ref. 8. Subsequent to the simulation, an effort was made to improve the GTRS mathematical model. Modifications were incorporated to improve the aerodynamic representation of the engine nacelles and the rotor inflow dynamics. The modification to the inflow dynamics resulted in a much improved calculation of the rotor low-μ flapping response. Figure 9 presents a comparison of simulated XV-15 sideward flight trim characteristics with flight test data for the improved mathematical model. The correlation of simulated lateral stick position and pedal position with flight test data is fairly good, considering the scatter in the flight test data. However, the predicted roll attitude is approximately one-half what would be expected for a particular airspeed. A comparison of main rotor power required (not shown) indicates that the GTRS mathematical model overpredicts power as lateral airspeed is increased. Several possible reasons for the remaining discrepancies have been identified, and it is quite possible that a combination of these reasons are the cause for the less-than-desired fidelity. These include:

- Incorrect modeling for rotor downwash effects on the wing, fuselage, and engine nacelles at large sideslip angles
- Lack of appropriate ground effect modeling in sideward flight at low wheel heights
- Possible errors in the analytically determined values for fuselage aerodynamics at 90 and 270 deg (the XV-15 wind-tunnel model was never tested in sideward flight).

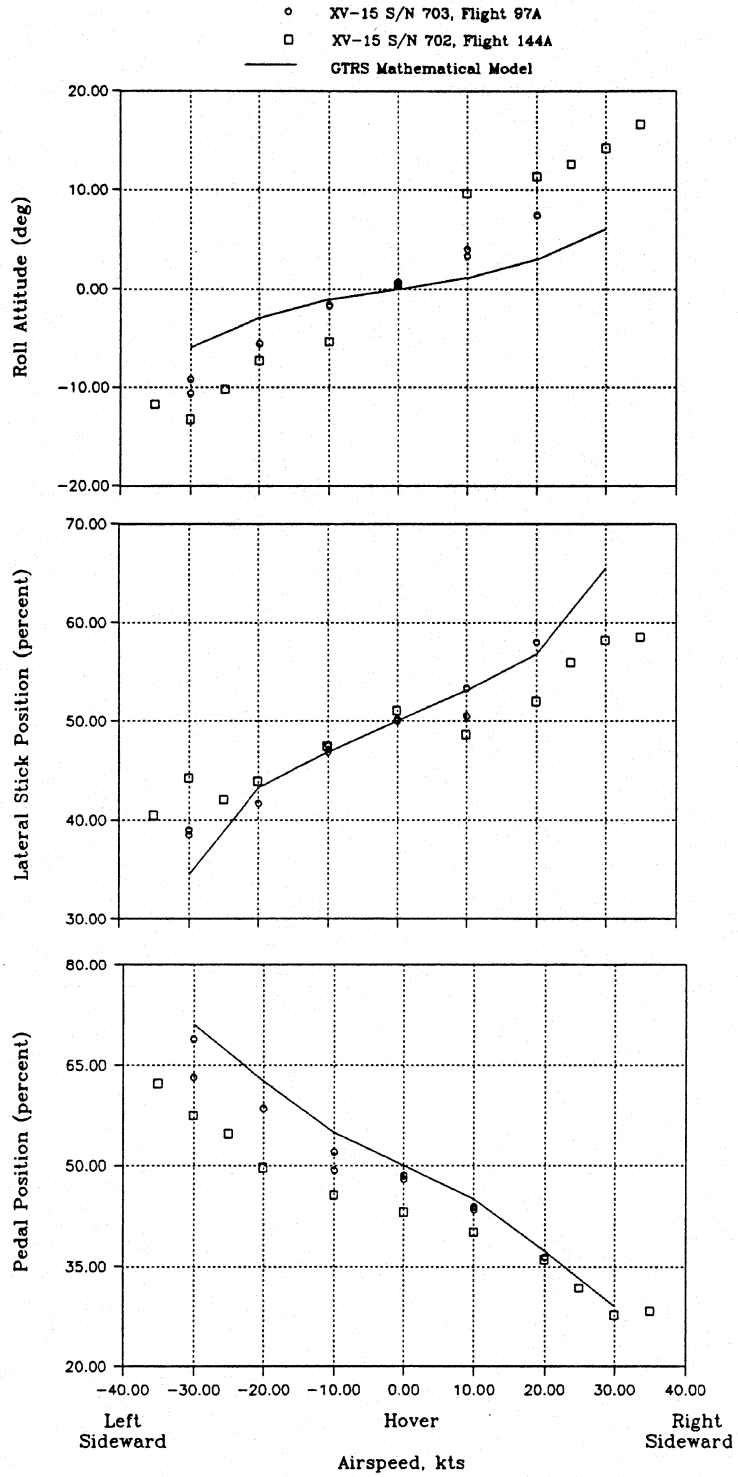


Figure 9. Correlation of XV-15/GTRS Sideward Flight Characteristics

- Still as yet unmodeled low μ, high inflow aerodynamic rotor effects that have a significant effect on the calculation of rotor flapping angles

- Incorrect modeling of the tandem rotor effect in GTRS resulting in an incorrect inflow to the trailing rotor.

Since high fidelity in the low-speed sideward flight regime is crucial to the simulation of many tasks (e.g., shipboard landing in a crosswind), continued analysis of this deficiency is planned so that modifications can be made to improve GTRS fidelity.

4. Short Takeoff and Landing (STOL) Performance

Another fidelity deficiency that was identified during the simulation was associated with the XV-15 STOL characteristics. During simulated takeoffs, pilots commented that the takeoff run was excessive and that the pilot was required to input a significant amount of aft stick in order to rotate the nose. In the XV-15, the pilots stated that the aircraft tended to fly itself off the runway following a relatively short takeoff roll. Likewise when landing, the pilots commented that the simulator did not reproduce the same in-ground effect feeling that was present in the XV-15 and that the rollout seemed to be excessive in the simulator. Several possible reasons exist for this deficiency, which include:

- The lack of incorporation of a wing in-ground effect model

- Inadequacies in the landing gear model that resulted in the wrong wing angle of attack being calculated during the takeoff and landing rollouts

- Unmodeled or incorrectly modeled interactive aerodynamic effects among the rotor, wing, and horizontal tail when in ground effect.

This deficiency has not been investigated by STI due to its low priority and the requirement that the VMS be available. However, improvements to the GTRS model to alleviate this deficiency should be planned as piloted simulation time becomes available during future VMS simulations.

5. Hover Dynamic Response Characteristics

The hover response characteristics of the XV-15, both stability and control augmentation system (SCAS) ON and SCAS OFF, were evaluated and correlated in two ways using both the batch and the simulation versions of the GTRS program. (Results from the SCAS ON correlation will not be presented because of the amount of text required to define configurations. In general, the SCAS ON correlation between the mathematical model and the XV-15 is quite good, and no significant discrepancies were identified.) The batch version of GTRS was used to investigate XV-15 dynamic response correlation with small perturbation theory control power and stability derivative results. Correlation of mathematical model and the flight test time histories was conducted using both versions of GTRS. Figure 10 presents a comparison of hover SCAS OFF control power and stability derivative results, as calculated from several different groups of flight-test time histories of XV-15 step responses, with those calculated from the GTRS batch program. MIL-H-8501A (Ref. 15) and MIL-F-83300 (Ref. 16) boundaries are also included in Fig. 10 in order to show how the unaugmented XV-15 configuration performs with respect to handling qualities specification criteria. Control power correlates well about all three axes; however, damping, especially about the pitch and yaw axes, is always predicted to be lower than that measured in flight test.

Pitch damping, as calculated from flight test time histories, varied from 0.7 to 1.0 1/sec. This damping value was computed by dividing the calculated control sensitivity ($\ddot{\alpha}_{MAX}/\delta_{LONG}$) by the calculated control response ($\dot{\alpha}_{MAX}/\delta_{LONG}$). The GTRS-computed value is approximately 0.35 1/sec. Reasons for this difference are, at this time, not fully understood. One possibility is that different methods are used to calculate the data points, i.e., small perturbation versus measurement from flight test time histories. The small perturbation results assume that instantaneous step inputs are used; whereas, the flight test step inputs are never pure instantaneous step inputs. Another possibility being investigated, which was discovered when looking into the yaw

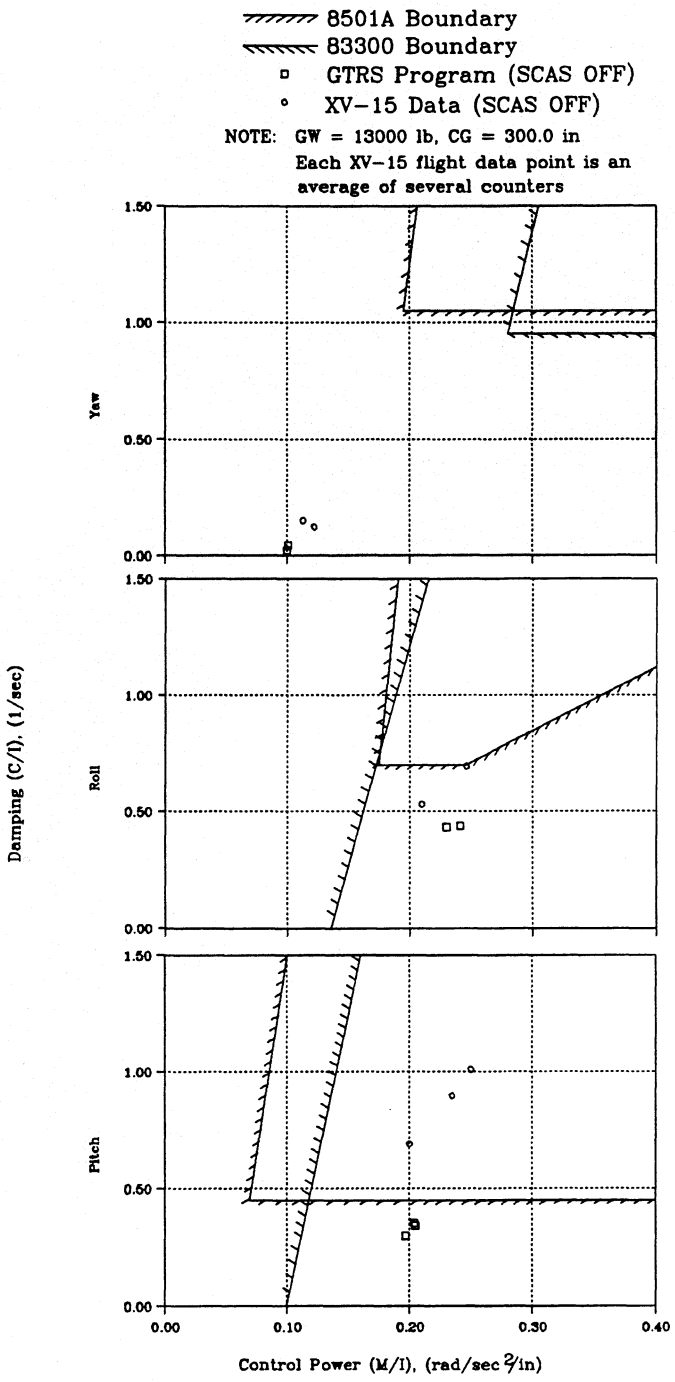


Figure 10. Correlation of XV-15/GTRS SCAS OFF Hover Control Power and Damping

damping discrepancy, is that certain components of the GTRS airframe (e.g., the rotor spinner and pylons) do not have the appropriately calculated velocities

and angle-of-attack or sideslip angles applied to aerodynamic calculations when the c.g. velocity is very close to zero and the rotational velocities (p, q, r) are significant non-zero values. While this is not expected to account for all of the observed damping discrepancy, it may result in an improvement when corrections are made to the program and a re-evaluation is conducted. It is also quite possible that interactive hover aerodynamic effects among the rotor, fuselage, wing, and horizontal tail are too complex to expect a precise calculation of aerodynamic damping to be made using small perturbation theory.

A time history response of a SCAS OFF pitch step is presented in Fig. 11 for Counter 7969. As can be seen, correlation does look improved when results are presented in this type of format.

This time history comparison of flight test and GTRS data was constructed by first measuring the difference in flight test longitudinal stick position from an assumed trim (approximately 44.5 percent) as a function of time. This table of measured values, the step, was then input to GTRS by adding the values (as a function of time) to the trimmed GTRS stick position. This process accounts for the trim offset. It must be noted that the correlation of the pitch response cannot be expected to be exact. One reason for this is due to the fact that the flight test pitch rate is not exactly zero immediately prior to the step (a slightly non-trimmed situation exists). A second reason is due to uncertainty in the measured pitch gyro information. The dashed lines for pitch attitude and pitch rate represent the integral of the pitch rate gyro and derivative of the pitch attitude gyro, respectively. If both gyros are perfectly aligned and calibrated, the solid and dashed lines should match exactly. Since both lines do not match exactly, this difference provides an insight into the uncertainty in the measured pitch response. Comparisons with other counters yielded similar correlation results, and, in some cases, the predicted GTRS pitch response was greater than the flight test measured response (opposite to this case).

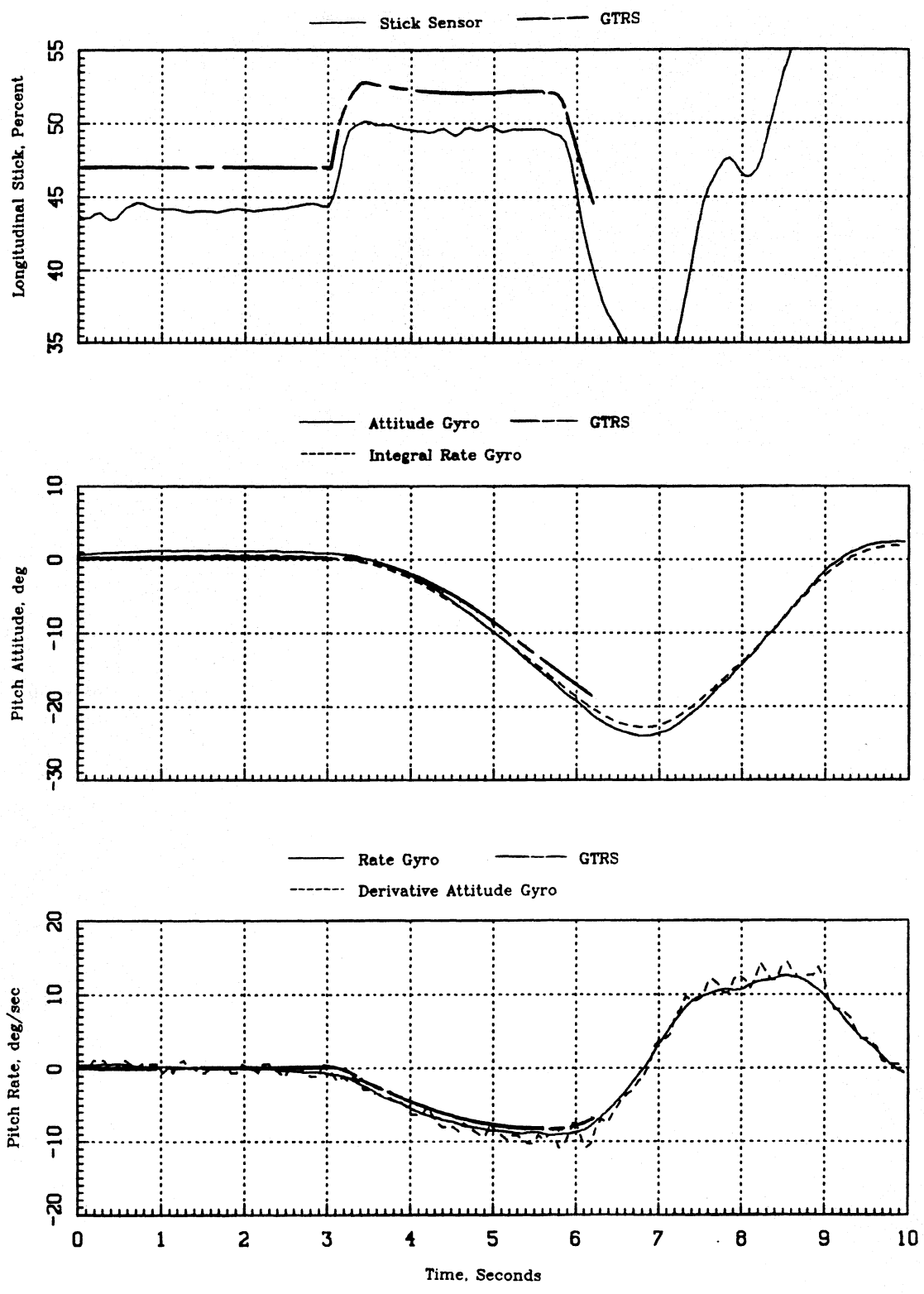


Figure 11. Time History Correlation of a Longitudinal SCAS OFF Step in Hover

The study of values for yaw damping in hover also provided interesting insight into the formulation of GTRS mathematical model equations. The correlation effort was conducted using both the small perturbation and time history comparison approaches. Values from GTRS and flight test (approximately 0.15 1/sec) were expected to be low; however, both approaches to obtaining calculated values were not, for all practical purposes, expected to yield "zero." An example of a time history comparison (Counter 8047) is presented in Fig. 12. It is believed after study that one of the reasons for the poor correlation (as was stated in a previous paragraph) is related to equation errors where aerodynamic data tables are entered incorrectly for some aerodynamic components of the airframe when the c.g. velocity is zero and body axis angular rates are non-zero. It was also discovered that aerodynamic calculations on the yaw axis in the batch program were very sensitive to perturbation step size. A second reason for poor correlation may be due to a lack of appreciation of the effect of wind (or interactional aerodynamic flows) on yaw damping. It was discovered that the GTRS calculations were very sensitive to small variations in airspeed or wind velocity. This sensitivity is presented in Fig. 12 for a 5 kts airspeed as compared to a perfect hover. Unfortunately, it was not possible to determine the winds accurately for any of the available flight test counters to within 5 kts.

As a result of the discoveries made in this hover dynamic response evaluation, each of the individual airframe components (e.g., rotor pylon, tail, spinner, etc.) of the GTRS model will be reviewed and modified to ensure that low-speed aerodynamic calculations are computed correctly. While these program modifications may not be wholly responsible for the SCAS OFF discrepancies, they may noticeably improve correlation. An evaluation of the data reduction techniques involved will also be made (small perturbation versus time history). When these techniques have been reviewed and corrections to the program are completed, a further evaluation of the damping discrepancy will be conducted.

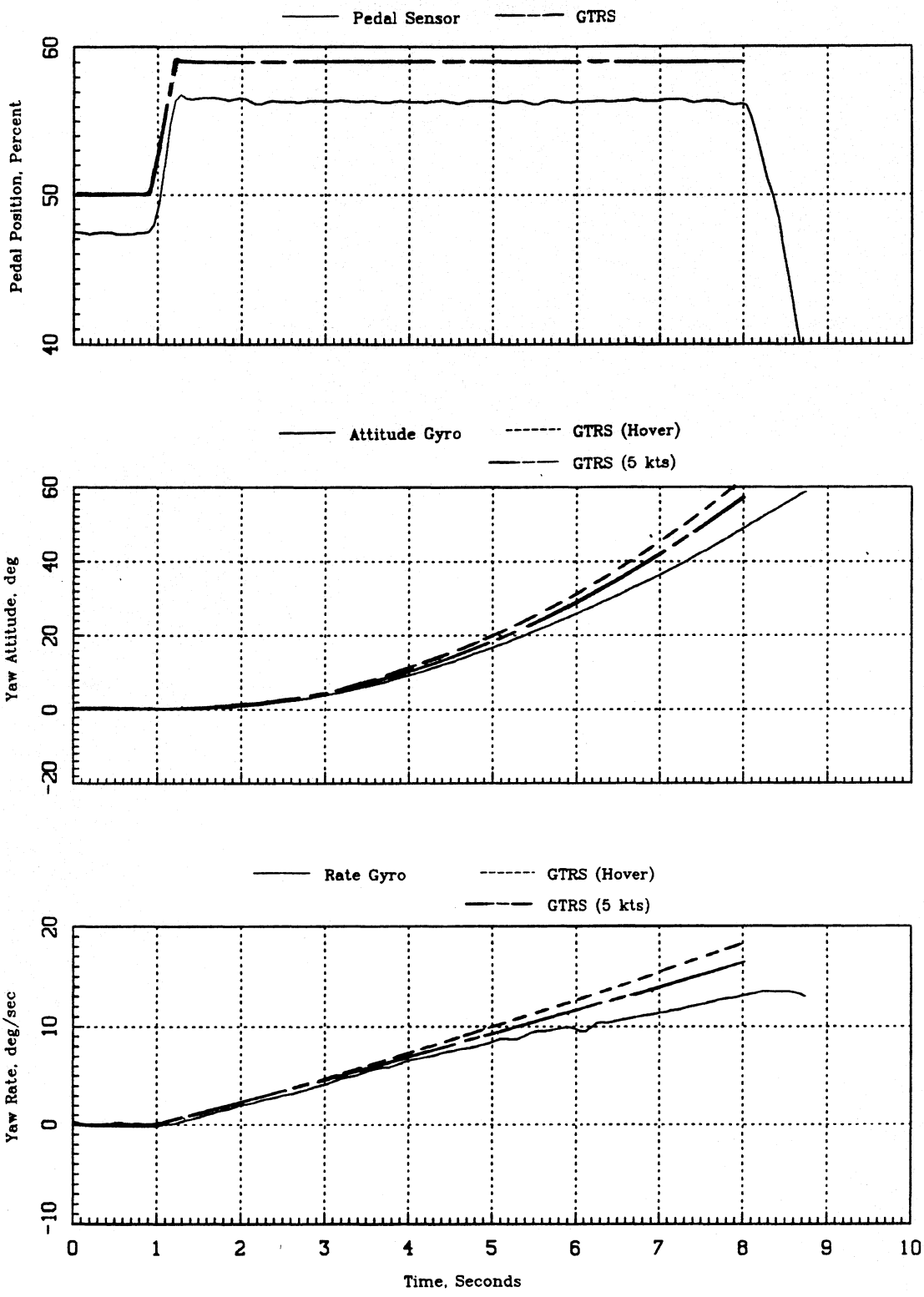


Figure 12. Time History Correlation of a Pedal SCAS OFF Step in Hover

B. HELICOPTER MODE VERIFICATION

Since the helicopter mode of flight is where conversion begins or ends and since this task and the approach and landing are critical design evaluation tasks, it is important to correlate flight test results with the simulation (even though this mode will probably comprise only a small fraction of total flight time). Unfortunately, since the XV-15 is a proof-of-concept tilt rotor and not a helicopter, a large body of data does not exist for performance or handling qualities validation in this mode. Therefore, the correlated flight test data that are presented in this section should be evaluated with caution.

Flight test and simulator trim characteristics of the XV-15 that have been correlated are generally in good agreement. Figure 13 presents a comparison of flight test data with predicted results at 85 deg nacelle incidence. While results from this particular flight compare quite well, comparison with some of the other sources is confusing. In several of these cases, results generally compare quite well at 90 deg nacelle incidence up to a calibrated airspeed of approximately 75 kts. At this airspeed, a strange thing happens in that the mathematical model predicts a strong nose-up pitching moment as the power required also increases dramatically. The XV-15 does not seem to exhibit this trend. At present, this effect is not totally understood, and further investigation will be conducted in an attempt to explain this discrepancy.

Helicopter mode correlation of SCAS OFF control power is provided in Fig. 14. While this comparison appears quite good, the results must nevertheless be considered preliminary due to the limited amount of flight test data available for correlation.

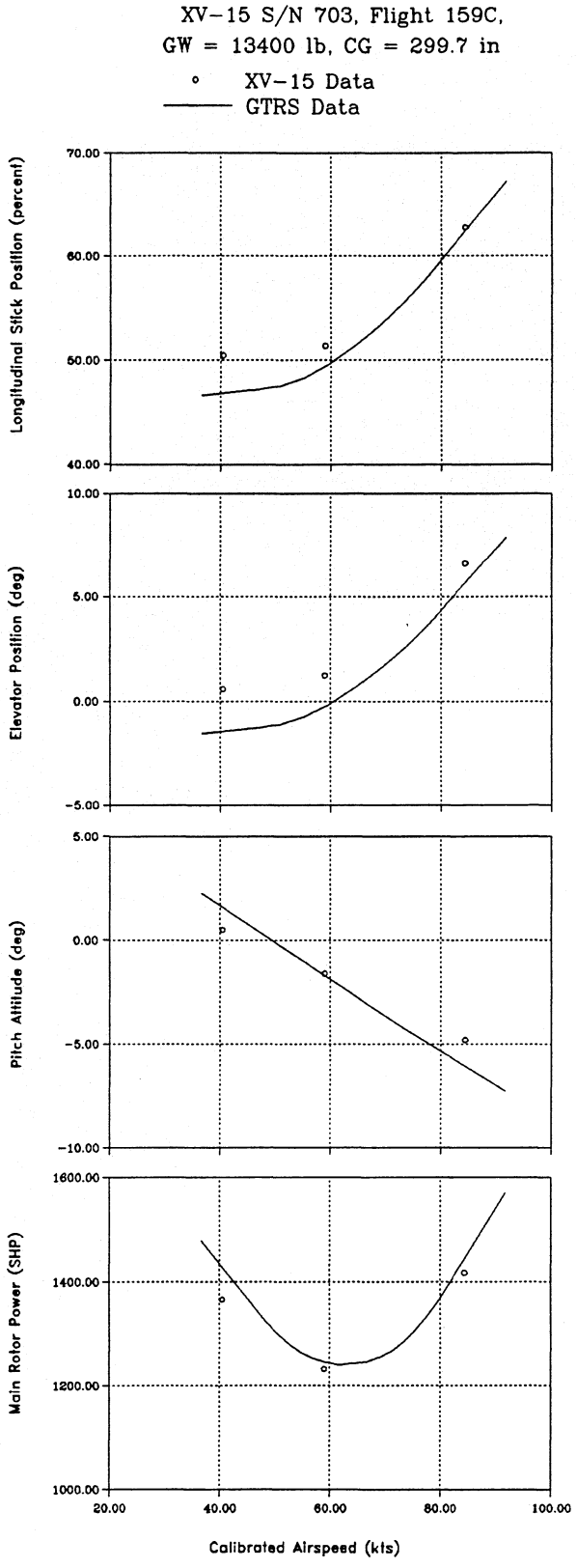


Figure 13. Correlation of XV-15/GTRS Helicopter Trim Characteristics

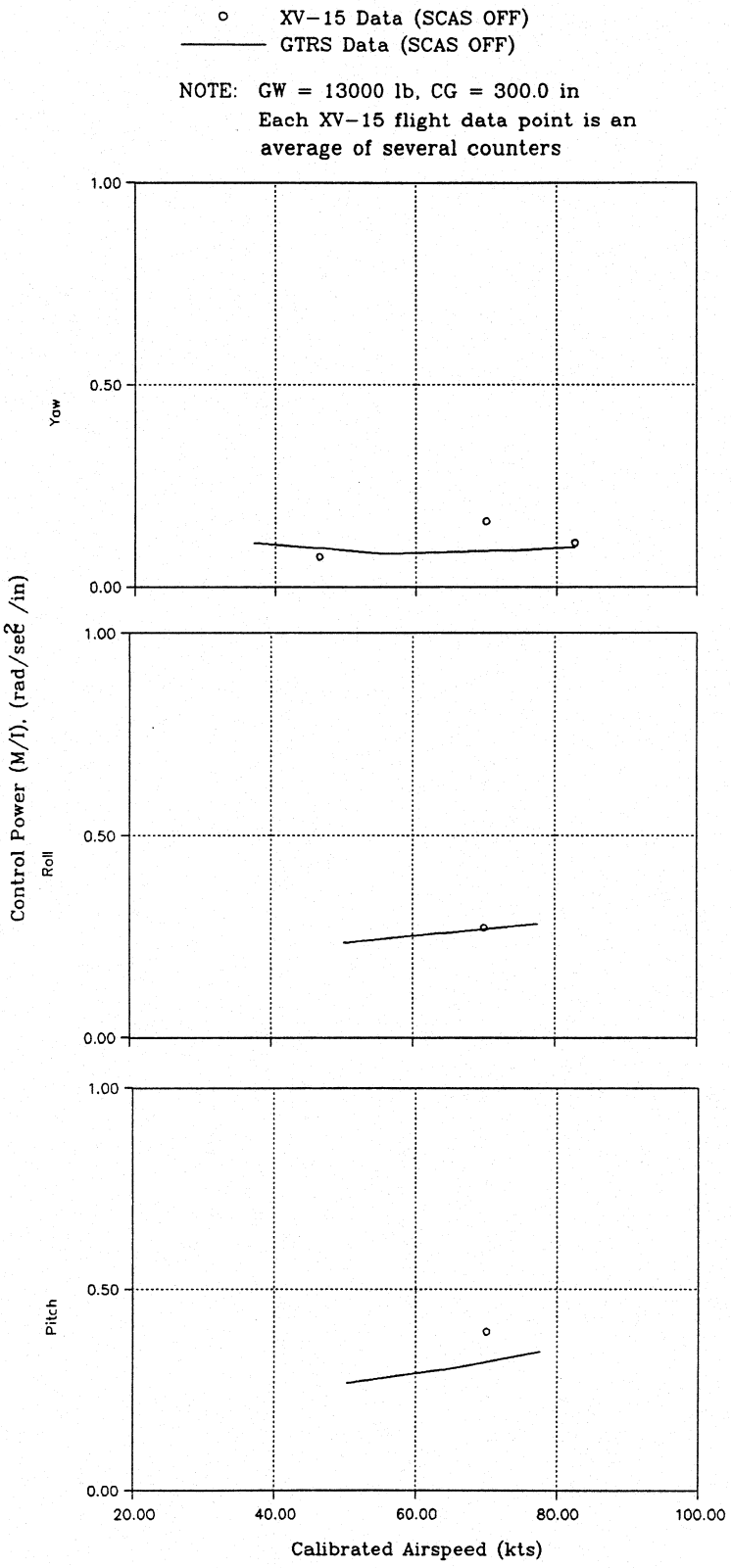


Figure 14. Correlation of XV-15/GTRS SCAS OFF Control Power in Helicopter Mode

C. CONVERSION MODE VALIDATION

During the simulation validation effort on the VMS, one of the identified deficiencies involved a requirement for a reconversion piloting technique somewhat different from that used with the actual XV-15. The major cause of this deficiency was identified subsequently as a mathematical modeling deficiency. The main pilot complaint centered around a requirement that the pilot input some aft longitudinal stick in order to slow down the simulated XV-15. In flight immediately following the initiation of reconversion, the XV-15 was known to rapidly lose airspeed. Some limited and less-than-rigorous performance calculations that had been made from XV-15 flight test data indicated that, when the wing tips were uncovered, there was a significant increase in drag. This level of drag was considerably above that which had been measured from wind-tunnel tests and used as data table inputs to the GTRS program. The XV-15 wind-tunnel model had smooth surfaces on the tip of the wing and the inside portion of the engine pylon when not in airplane mode; whereas, the actual XV-15 wing tip and the corresponding airfoil-shaped area on the inside portion of the engine pylon are not covered by a smooth sheet-metal surface. The engine, pylon actuator, and structure that is exposed results in increased drag. Wind-tunnel and flight tests also reveal a strong vortex at the wing/pylon intersection that insures that the airflow is turbulent in this area. In order to simulate this effect, a cosine function was implemented to provide an increase in drag as a function of pylon angle. This modification, along with a correction to a mathematical modeling error involving the spinner drag, eliminated pilot complaints about reconversion fidelity. The original form of this modification was:

$$D_{PYL} = [C_1 + C_2 \cos^6(90 - i_N)]q_F$$

where C_1 and C_2 are constants of 1.0 ft^2 and 13.5 ft^2, respectively. During the Phase II analysis, a decision was made to remove the $[C_1 + C_2 \cos^6(90 - i_N)]$ portion

of the equation and replace it with a data table, where drag is a function of mast angle. This provides the user with a more flexible way to model the drag function, since an explicit analytical expression is no longer required.

D. AIRPLANE MODE VALIDATION

Along with hover and low speed, the airplane mode of flight is the most important for tilt-rotor aircraft. This is because the majority of flight time will probably be spent in this mode. Correlation of results with flight test for this mode of flight have been quite good, due largely to the detailed formulation of the original XV-15 mathematical model by BHT in Ref. 2.

Examples of trimmed level flight and performance correlation are presented in Figs. 15 through 18 for both prototype XV-15 aircraft. Data for XV-15 Ship Number (S/N) 702, which is located at BHT, is presented in Figs. 15 and 16, and data for S/N 703 located at NASA ARC is presented in Figs. 17 and 18. As can be seen for S/N 702, the longitudinal stick position, pitch attitude, elevator position, and power required match closely throughout the airspeed range, and the modifications that were made to the rotor model, as stated earlier, yielded improved correlation of power required with airspeed. The predicted effect of altitude on power required also looks good in Fig. 16 for flights 196C and 197A.

If the same simulation mathematical model input data are used for correlation with S/N 703 (i.e., the assumption is made that both aircraft are identically configured), then the results are somewhat confusing. As can be seen in Fig. 17, the predicted trim control position and pitch attitude data, as presented by the solid line, do not correlate as well as with data presented for S/N 702. Following an investigation, the poor quality in the longitudinal stick data comparison was discovered to be an instrumentation error. This error, if the data is corrected, results in a displacement of the plotted flight test data to twice the distance from the 50 percent reference position (i.e., a data point at 52 percent should be 54 percent, a data point at 46 percent should be 42 percent). In comparing the pitch attitude data (using a combined plot of S/N

702 and S/N 703 data), it was noticed that, at the same calibrated airspeed, the nose attitude of S/N 703 always tended to be one to two degrees more nose up than S/N 702. Originally, it was assumed that this must be an instrumentation difference. However, almost by accident, it was recalled that S/N 702 had always had Gurney tabs on the wing trailing edge, whereas, S/N 703 had not. A removal of the Gurney tab aerodynamics from the simulation input data resulted in the data represented by the dashed line. As can be seen, this configuration correlates better with flight test results. However, the unresolved hangup is that, when the records were reviewed, there appeared to be some confusion, and it could not be confirmed that the Gurney tabs were actually off S/N 703 during flights 129 and 132. Therefore, further study will be given to this problem at a later date. Power required correlation with both the Gurney tabs on and off is shown in Fig. 18. At high airspeeds, the predicted power required appears to be slightly greater than the flight test data. However, the data on this graph were not corrected for rate of climb/descent and acceleration/deceleration effects, and correction of two high speed data points tended to shift the flight test data points to higher powers.

Another area of interest in the correlation effort involved the sensitivity of longitudinal stick position (or elevator position) to variations in the input data array (in the event the input wind-tunnel data were not exactly representative of the full-scale aircraft). The amount of longitudinal stick required to compensate for a +0.5 degree shift in wing downwash at the tail or in the horizontal tail incidence was calculated to be approximately -2.0+ percent stick position (or -1.0+ degree elevator position). Believable variations in other input values, such as dynamic pressure loss at the horizontal stabilizer, yielded similar variations in trim control position. Pitch attitude did not vary significantly with these types and magnitudes of perturbations. When considering the errors that might have been encountered in constructing the input data tables from the wind-tunnel data and the error inherent in measuring

flight test data, this excellent trimmed flight correlation is a reflection of the quality of work that went into the construction of the original XV-15 mathematical model by BHT.

Correlation of lateral-directional static stability in the airplane mode also yielded good results. Figure 19 presents data for the airspeed range from approximately 167 to 188 kts. While the calculated cockpit control positions vary in trim from flight test data, the gradients of control position with sideslip do not vary significantly. The calculated roll attitude gradients may be greater than flight test; however, without more flight test data, it is hard to confirm this conclusion. The offset in longitudinal stick position is affected by the instrumentation error discussed previously.

Airplane SCAS OFF dynamic response characteristics were evaluated about each axis of the XV-15 at airspeeds ranging from approximately 150 to 190 kts. It was discovered that the values used for control effectiveness of each control surface (elevator, rudder, and aileron) were in need of adjustment if control response was to match that of the XV-15 in flight. Values previously used as inputs to the mathematical model were based on wind-tunnel model data (Ref. 19) and increased to account for what was thought to be a scaling effect. Table 1 presents a comparison of the measured wind-tunnel model values, the old simulation values, and the present simulation values for control effectiveness. The values used for elevator and rudder effectiveness are reduced from those used previously in the simulation and are close to those originally measured in the wind tunnel; whereas, the aileron value was increased. It is thought that the increased aileron effectiveness is due to the end-plating effect of the pylons as well as increased air velocity over the surfaces due to the vortex at the wing tip/pylon juncture.

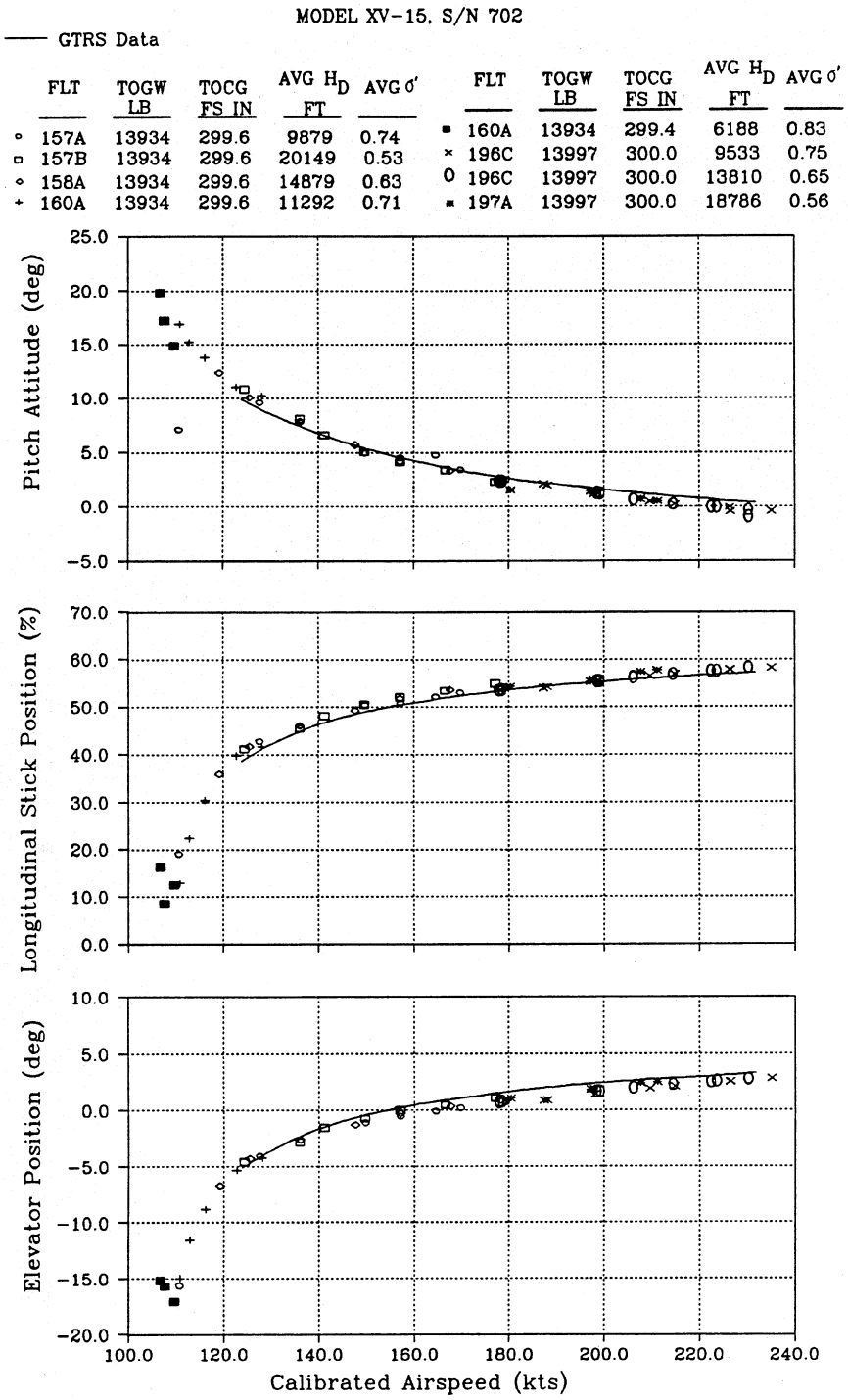


Figure 15. Correlation of GTRS Trim Characteristics in Airplane Mode with Flight Test Data From XV-15 S/N 702

MODEL XV-15, S/N 702

GTRS Runs
——— 196C (H_D = 9533)
-·-·- 197A (H_D = 18786)

	FLT	TOGW LB	TOCG FS IN	AVG H_D FT	AVG σ'
°	157A	13934	299.6	9879	0.74
□	157B	13934	299.6	20149	0.53
◇	158A	13934	299.6	14879	0.63
+	160A	13934	299.6	11292	0.71
■	160A	13934	299.4	6188	0.83
×	196C	13997	300.0	9533	0.75
0	196C	13997	300.0	13810	0.65
*	197A	13997	300.0	18786	0.56

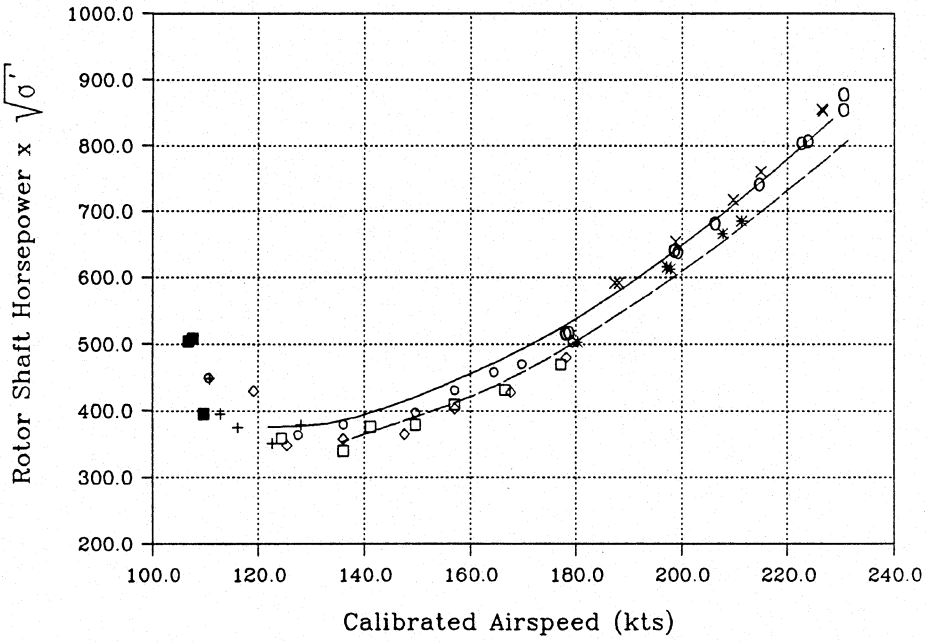


Figure 16. Correlation of GTRS Airplane Mode Power Required with Flight Test Data From XV-15 S/N 702

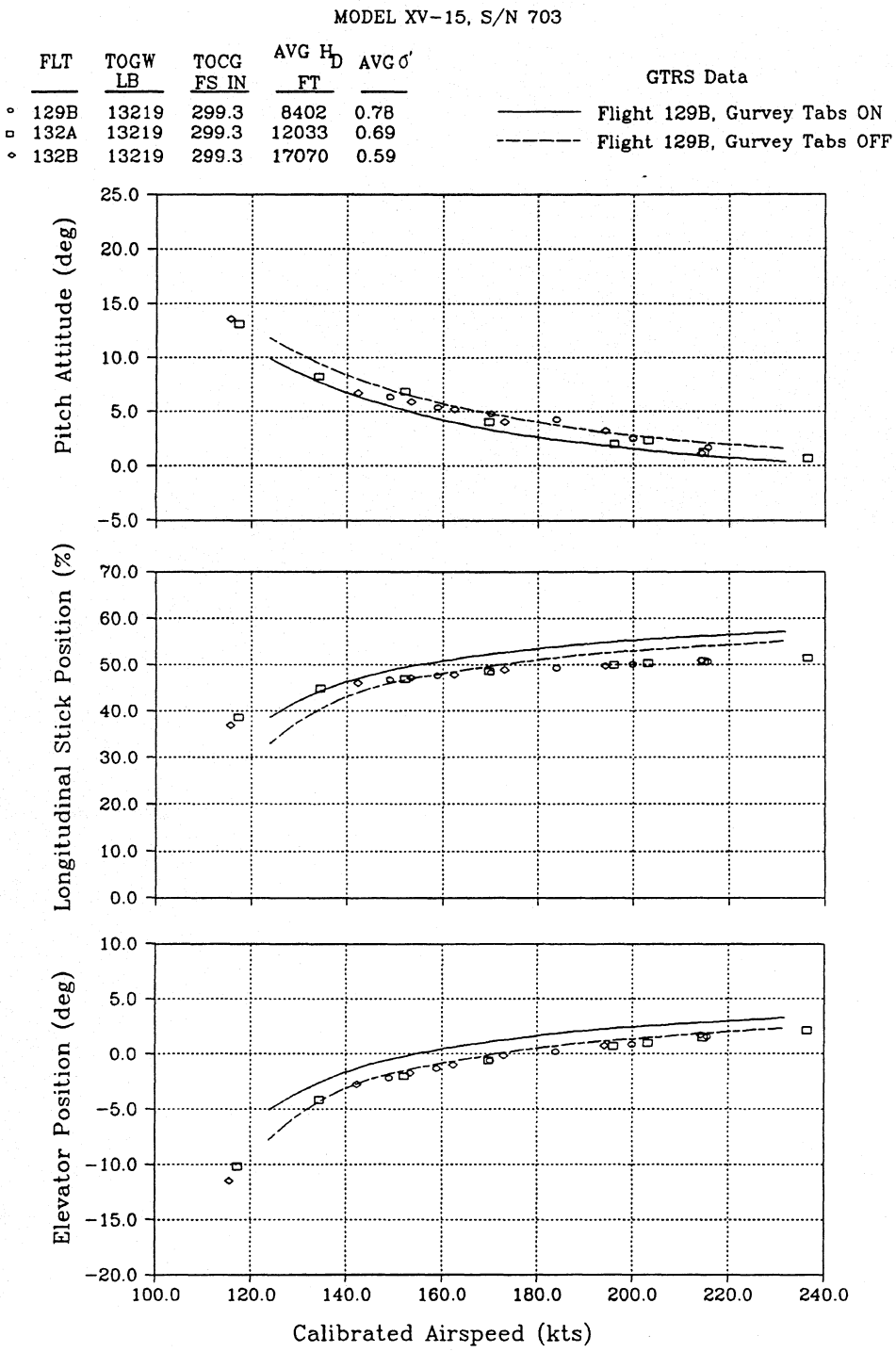


Figure 17. Correlation of GTRS Trim Characteristics in Airplane Mode with Flight Test Data From XV-15 S/N 703

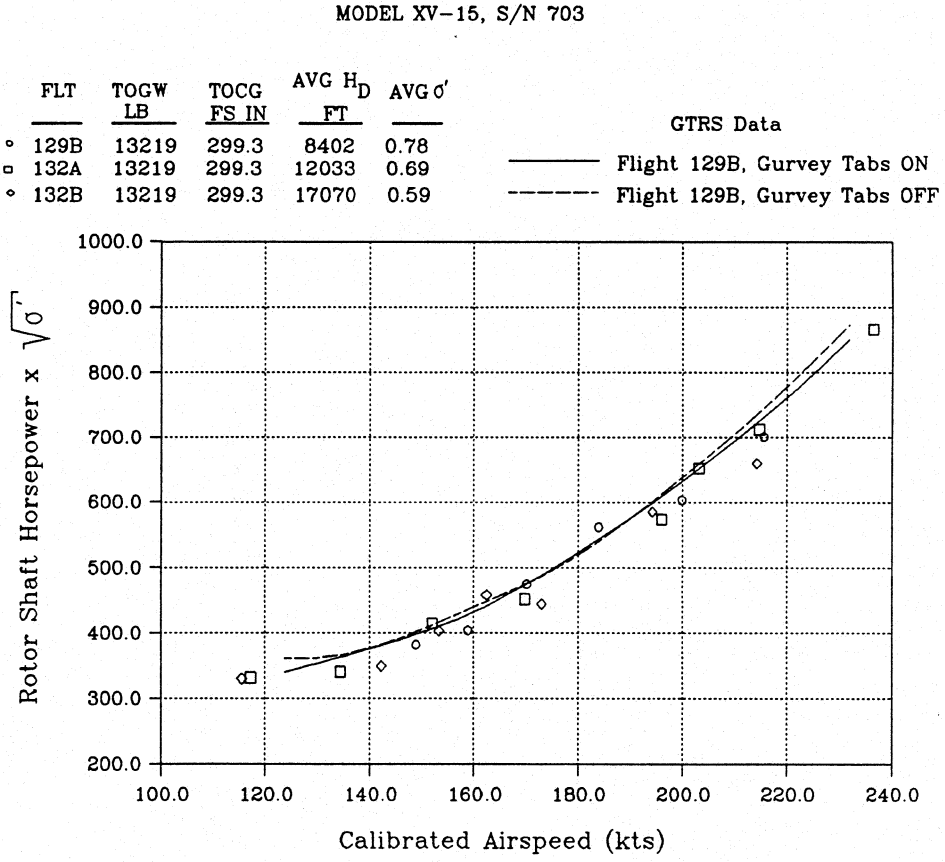


Figure 18. Correlation of GTRS Airplane Mode Power Required with Flight Test Data From XV-15 S/N 703

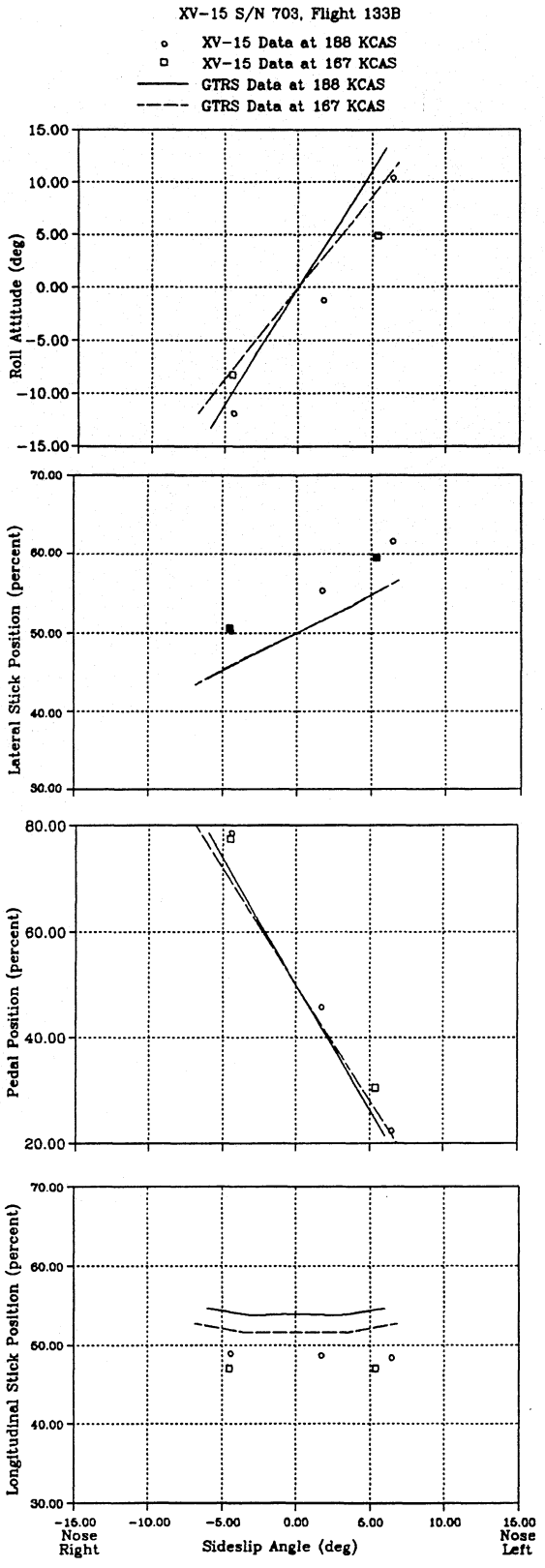


Figure 19. Correlation of GTRS Lateral/Directional Trim Characteristics with XV-15 Flight Test Data

TABLE 1. MATHEMATICAL MODEL VALUES FOR CONTROL EFFECTIVENESS

	Measured Wind Tunnel Values	Old Simulation Values	GTRS Simulation Values
Elevator Effectiveness (τ_e)	0.512	0.575	0.518
Rudder Effectiveness (τ_r)	0.294	0.385	0.27
Aileron Effectiveness (τ_a)*	0.0056	0.005	0.00616

Both versions of the GTRS program were used in the effort to define the best values for control effectiveness. However, a higher priority was given to correlation with time histories than was given to correlation using the small perturbation stability and control power derivative approach. Figure 20 presents a summary of control power results obtained from the batch version using the derivative analysis approach. Time history correlations for several of the same counters are presented in Figs. 21 through 23 (pitch, roll, and yaw axes, respectively). In each of these figures, the correlation should not be expected to be exact for the same reasons (or uncertainties) as were mentioned in the discussion for the hover pitch step time history (Fig. 11). In general, the correlation is quite good. However, it is interesting to note, as with the hover response data, that when time history correlation is excellent, the small perturbation correlation may not always look as good (and vice versa). More study is planned to better explain and quantify this observation.

*Parameter varies significantly with flaps and conversion angle. This comparison is for flaps up in airplane mode.

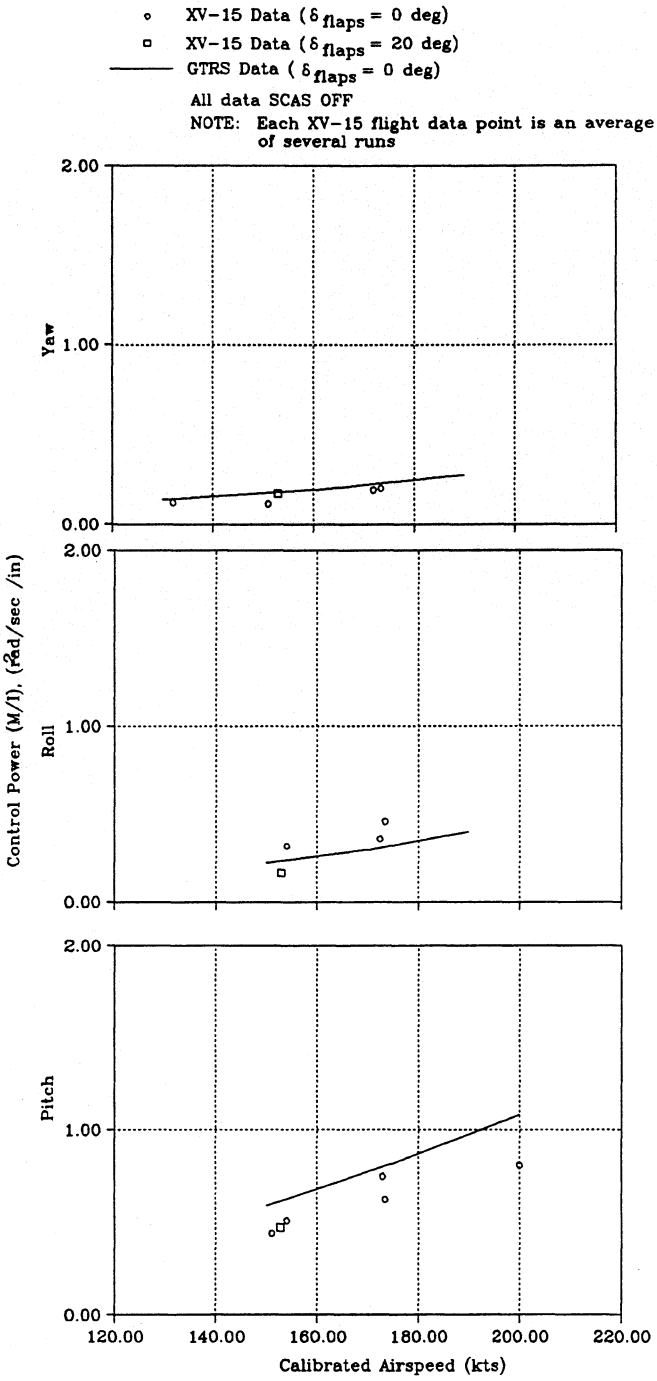


Figure 20. Correlation of GTRS Control Power in Airplane Mode with XV-15 Flight Test Data

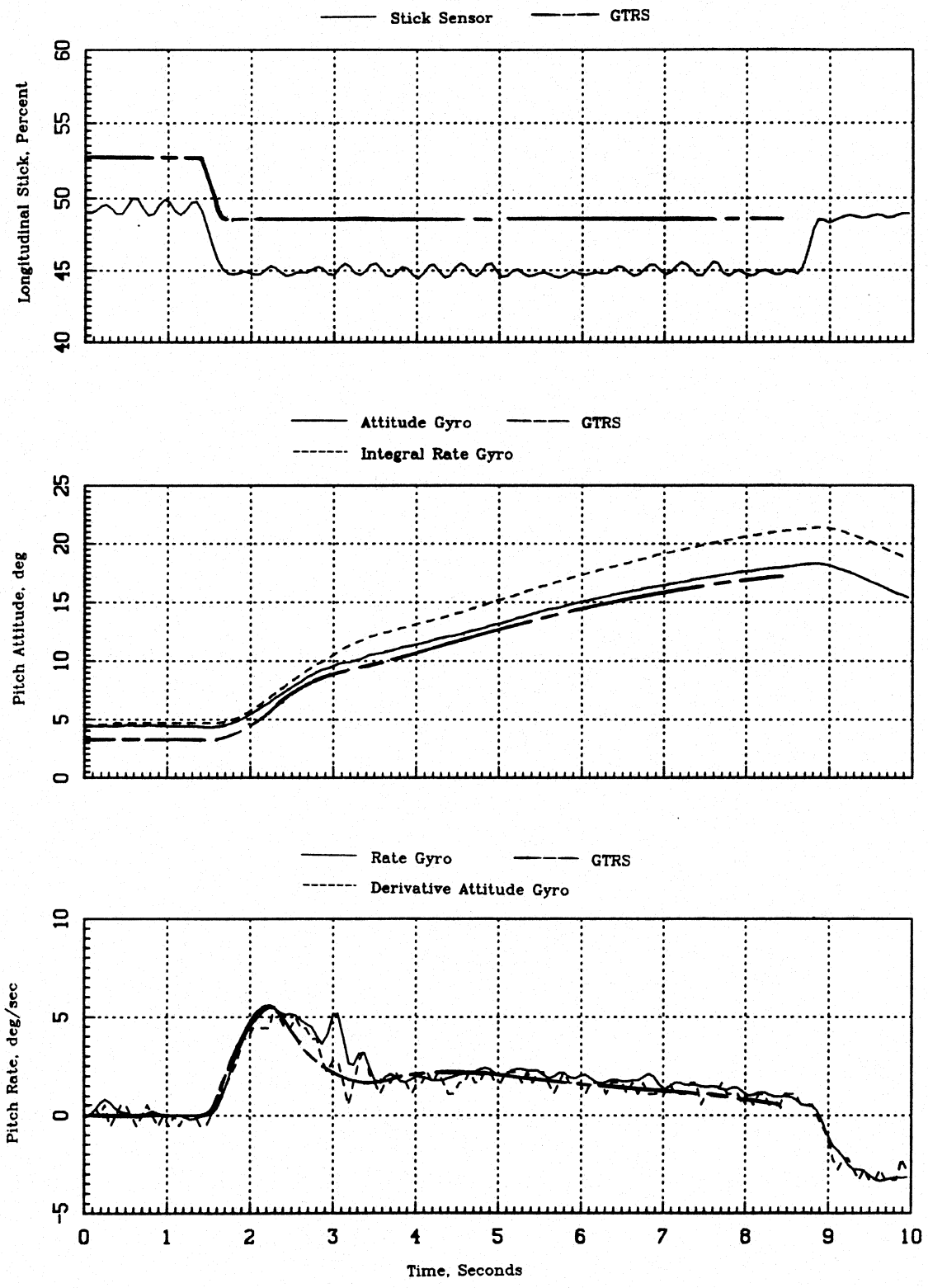


Figure 21. Time History Correlation of SCAS OFF Pitch Response in Airplane Mode

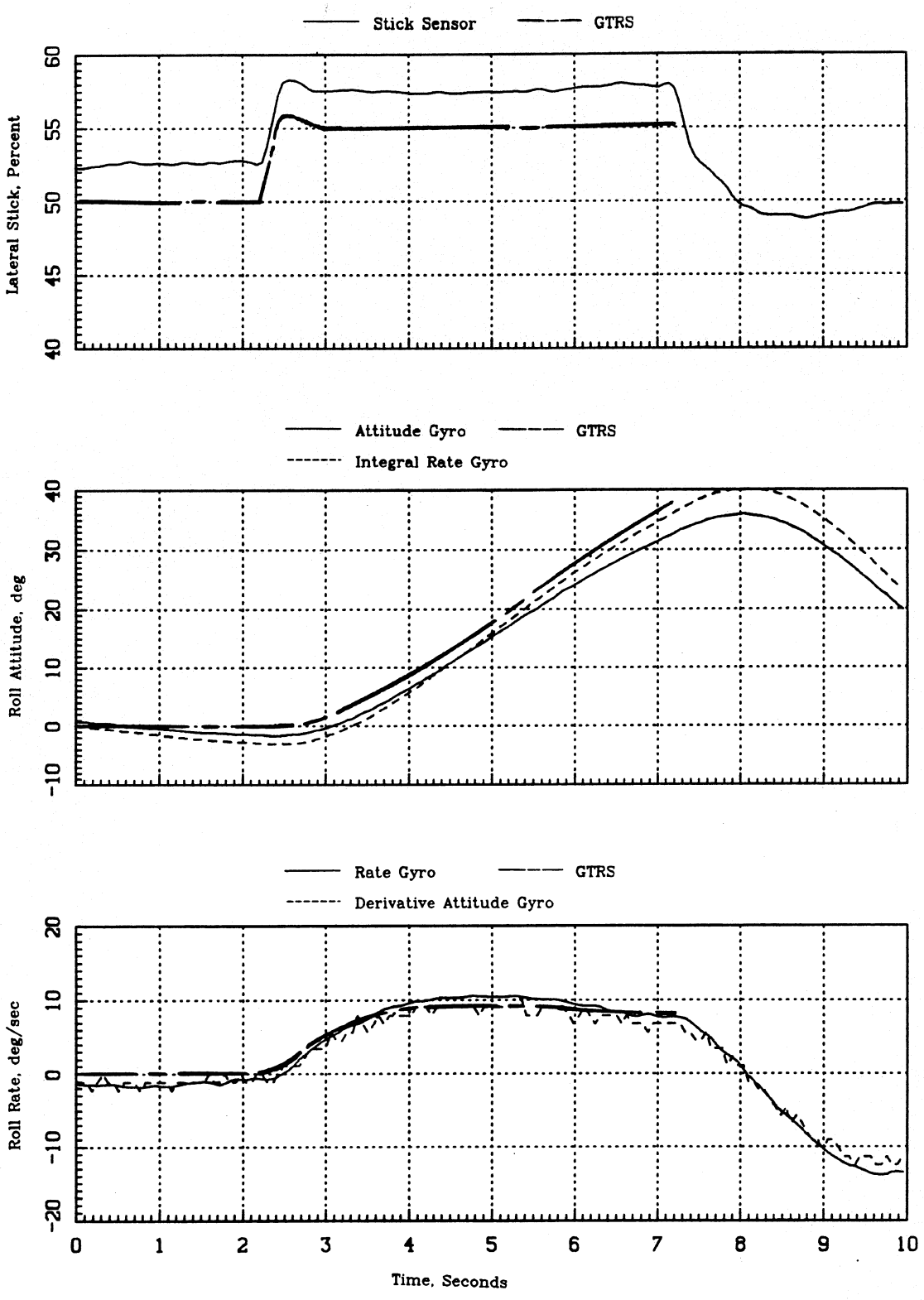


Figure 22. Time History Correlation of SCAS OFF Roll Response in Airplane Mode

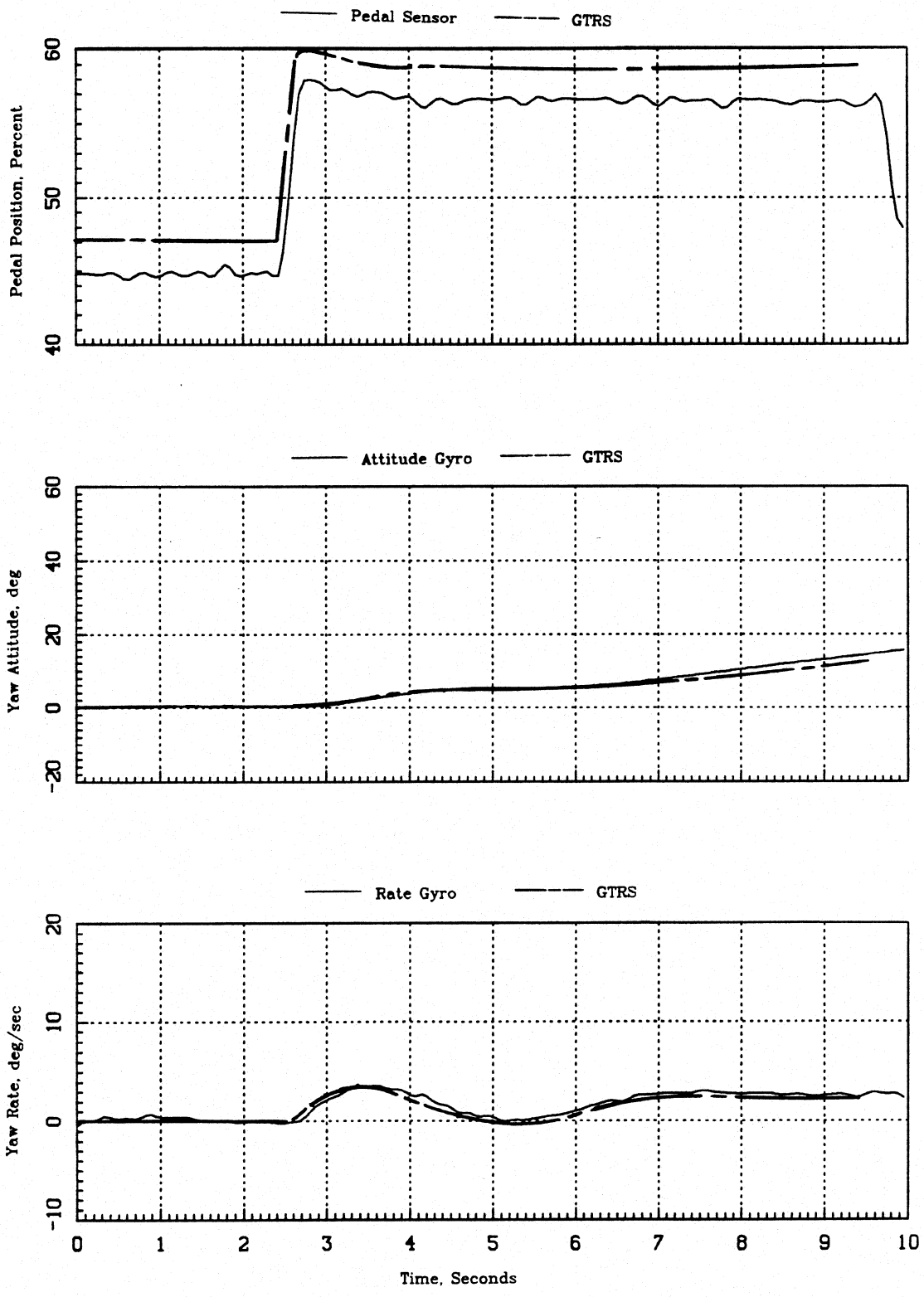


Figure 23. Time History Correlation of SCAS OFF Yaw Response in Airplane Mode

E. XV-15 MATHEMATICAL MODEL REFERENCE INFORMATION

As part of this report, it was deemed important for reference purposes to include a summary of GTRS trim and stability derivative information for a broad range of XV-15 flight conditions. An example trim page output is provided as Fig. 24, and an example stability derivative output is included as Fig. 25. These reference data, for variations in airspeed, altitude, and mast angle, are presented in Appendix A. Most of the presented flight conditions were originally predicted and documented by BHT in 1973 in Ref. 19. It should be noted that the helicopter and the airplane mode rotor speeds have changed from 601 to 589 and 458 to 517, respectively, as a result of flight test constraints.

```
************        AIRCRAFT TRIM FLIGHT CONDITIONS        ************

*************************************************************************
*** VT =140.00 KTS *** NACELLE INCIDENCE =  0.0 DEG  ***   AIRPLANE   ***
*** GW = 13000.0      RPM =  517.00   SLCG =  298.23   WLCG =   73.59 ***
***   MAST ANGLE =  90.00 DEG   *****   FLAP SETTING =      0/0  DEG  ***
*************************************************************************


                                  ----- EARTH REFERENCE -----
                                    UE          VE          WE
                RATE    (FPS)    236.3       -.2842E-13   0.0000E+00
                ACCEL  (FPS2)   -.3512E-04   0.3301E-07   -.3502E-04

                          --------------- BODY REFERENCE ---------------
                     UB          VB          WB          P           Q           R
RATE  (FT OR DEG/SEC)   234.6    0.2660E-06   28.57     0.0000E+00  0.0000E+00  0.0000E+00
ACCEL(FT OR DEG/SEC2)                                   -.4107E-06  0.1563E-02  0.1933E-05

----- ATMOSPHERIC CONDITIONS -----  ----- FLIGHT PATH CONDITIONS -----  ----- INERTIAS -----  ----- CENTER OF GRAVITY -----
ALTITUDE      (FT)          5000.00  CAL. AIRSPEED  (KNOTS)     140.01      (SLUGS-FT2)                  (IN)
DENSITY ALT.  (FT)             0.00  RATE OF DECENT (FPS)         0.00
PRESSURE ALT. (FT)             0.00  G-LEVEL        (G S)         1.00   IXX      0.5095E+05     S.L.      298.2
AMBIENT TEMP (DEG-R)         288.16  DYN PRES (SLUGS/FT-SEC2)    66.36   IXZ       1076.         B.L.     0.0000E+00
OUTSIDE AIR TEMP (DEG-C)      15.00  ANGLE OF ATTACK  (DEG)      6.944   IYY      0.2035E+05     W.L.      73.59
AIR DENSITY (SLUGS/FT3) 0.2377E-02  FLIGHT PATH ANGLE(DEG)      0.000   IZZ      0.6717E+05
                                    SIDESLIP ANGLE   (DEG)      0.000
THETES (ND)                1.00000  ROLL ANGLE       (DEG)      0.000
DELSTD (ND)                1.00000  PITCH ANGLE      (DEG)      6.944
SIGMA PRIME (ND)           1.00000  YAW ANGLE        (DEG)      0.000

----- CONTROL DISPLACEMENTS -----  --------------- POWER/TORQUE --------------- ---------- BLADE ----------
        (+)        (IN)      (PER)          POWER        TORQUE     GOV. PITCH   TIP SPEED        TIP MACH NO.
COLL    (UP)     3.3198     33.20          (SHP)       (FT-LBS)      (DEG)       (FPS)             (ND)
LONG    (FWD)    4.5382     47.27   LEFT    416.9         4235.       4.701       716.8           0.6421
LAT     (RT)     4.8000     50.00   RIGHT   416.9         4235.       4.701       716.8           0.6421
PEDAL   (RT)     2.5000     50.00   ENGINE  458.2

----- SWASH PLATE ANGLE (DEG) ----                  ----------- ROTOR -----------
        LEFT ROTOR   RIGHT ROTOR  ------------- FLAPPING ------------  ---- FORCES - MAST AXIS ------  -- JET --
THETAO    60.5015      60.5015              AO        LONG       LAT      THRUST     H-FORCE    Y-FORCE   THRUST
B1         1.5000       1.5000             (DEG)      (DEG)      (DEG)     (LBS)      (LBS)      (LBS)    (LBS)
A1         0.0000       0.0000     LEFT    1.1902    -0.2169    0.0896    680.41     156.97     -50.05    -9.74
                                   RIGHT   1.1902    -0.2169    0.0896    680.41     156.97     -50.05    -9.74

------- SURFACE POSITIONS -------          PROP      ADVANCE    INDUCED    INFLOW     COEFF      COEFF      COEFF
            (DEG)                         EFFIC.     RATIO     VELOCITY    RATIO      POWER      THRUST     DRAG
                                           (ND)       (ND)       (FPS)      (ND)       (ND)       (ND)       (ND)
     ELEVATOR          -1.2398     LEFT    0.7020     0.0422     1.2809     0.3484   0.000634   0.001273   0.014088
     AILERON            0.0000     RIGHT   0.7020     0.0422     1.2809     0.3484   0.000634   0.001273   0.014088
     RUDDER             0.0000
                                          CDRISE      CTEL      CDALPHA    CDLIM      CDMACH     CDFACT
                                           (ND)       (ND)       (ND)      (ND)       (ND)       (ND)
                                   LEFT  -0.04142    0.01291    0.01000    0.85000    0.35000    0.20000
                                   RIGHT -0.04142    0.01291

    TIME USED FOR THIS TRIM =   0.0212 MIN
```

Figure 24. Individual Trim Page Printout

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6316	0.0000	-0.5715	0.0000	-0.1928	0.0000
	ROTOR	0.0000	-0.1704	0.0000	-0.1406	0.0000	-0.1931	0.0000
	AIRFRM	0.0000	-0.4612	0.0000	-0.4310	0.0000	0.0002	0.0000
Q	TOTAL	0.9450	0.0000	-6.8295	0.0000	-1.1602	0.0000	0.7434
	ROTOR	0.8750	0.0000	-3.9661	0.0000	0.2193	0.0000	0.7434
	AIRFRM	0.0700	0.0000	-2.8634	0.0000	-1.3795	0.0000	0.0000
R	TOTAL	0.0000	5.9472	0.0000	-0.0497	0.0000	-0.8317	0.0000
	ROTOR	0.0000	3.9104	0.0000	-0.1904	0.0000	-0.5375	0.0000
	AIRFRM	0.0000	2.0368	0.0000	0.1407	0.0000	-0.2942	0.0000
U	TOTAL	-0.3824	0.0000	-0.2495	0.0000	0.0237	0.0000	-0.7591
	ROTOR	-0.3753	0.0000	-0.0094	0.0000	0.0172	0.0000	-0.7591
	AIRFRM	-0.0071	0.0000	-0.2401	0.0000	0.0065	0.0000	0.0000
V	TOTAL	0.0000	-0.1904	0.0000	-0.0053	0.0000	0.0057	0.0000
	ROTOR	0.0000	-0.0386	0.0000	-0.0002	0.0000	-0.0017	0.0000
	AIRFRM	0.0000	-0.1518	0.0000	-0.0052	0.0000	0.0074	0.0000
W	TOTAL	0.1551	0.0000	-0.7788	0.0000	-0.0209	0.0000	0.0030
	ROTOR	0.0112	0.0000	-0.0394	0.0000	0.0042	0.0000	0.0030
	AIRFRM	0.1439	0.0000	-0.7393	0.0000	-0.0251	0.0000	0.0000
RPM	TOTAL	1.7420	0.0000	0.2741	0.0000	-0.0918	0.0000	3.8001
	ROTOR	1.7621	0.0000	0.0283	0.0000	-0.0799	0.0000	3.8001
	AIRFRM	-0.0201	0.0000	0.2458	0.0000	-0.0119	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9834
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9834
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.9455	0.0000	0.5538	0.0000	-0.1992	0.0000	8.4024
	ROTOR	4.0073	0.0000	-0.0527	0.0000	-0.1704	0.0000	8.4024
	AIRFRM	-0.0618	0.0000	0.6065	0.0000	-0.0288	0.0000	0.0000
XLN	TOTAL	0.0225	0.0000	-1.4419	0.0000	-0.6257	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0225	0.0000	-1.4419	0.0000	-0.6257	0.0000	0.0000
XLT	TOTAL	0.0000	0.0054	0.0000	0.2079	0.0000	0.0426	0.0000
	ROTOR	0.0000	0.0054	0.0000	0.0157	0.0000	0.0472	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1923	0.0000	-0.0047	0.0000
XPD	TOTAL	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000

Figure 25. Stability Derivative Matrix Printout

SECTION V

SIMULATION SYSTEM DEVELOPMENT AND VERIFICATION

When a researcher is adequately satisfied that the important pieces of his mathematical model are verified, he must then proceed toward a complete systems verification before it is possible to accurately evaluate simulation validation. The systems verification step should be broken down into at least three separate parts that include the main computer, the cab and control system, and the simulation motion, visual, and aural systems. The end-to-end verification of these components will provide the basis from which simulation data evaluation and validation conclusions are made.

A. THE MAIN COMPUTER

The systems verification effort conducted with the main computer should first center on a re-verification of the mathematical model(s) as a complete and interactional package that must function in a timely and accurate manner. When in a batch mode or time lengthened simulation mode, which is usually the environment used for initial checkouts, a mathematical model may seem to behave much differently than when running in a real-time environment. An excellent example of this type of problem occurred in the simulator during an evaluation of the XV-15 heave response. It was discovered that the mathematical model subroutine call sequence was arranged in such a way that it resulted in a one main computer cycle time (ΔT) delay in the mathematical model calculations being made for update of the governor and engine response. This resulted in the predicted XV-15 heave response being slightly degraded. Had the mathematical model been cycling at a 10- or 20 msec time frame in an off-line (non-real-time) application, then the resulting problem would have been insignificant. In a 70-msec real-time application where other lags exist in the system, this type of problem can often influence simulation results.

Main computer ΔT effects (or computational delays) can be looked at from several perspectives. One way is to ignore them. In doing so, a researcher justifies to himself that they are acceptable in the mathematical model/computer environment, because the real-world rotorcraft has control system flexibility as well as other hardware and aerodynamic-related effects that will result in small lags (or delays). This perspective is acceptable if this is where the researcher wants to "deposit" his flight-rationalized simulation delays. What is crucial is that the researcher measure this delay and keep track of it during the rest of the systems verification process, because other delays will follow that will have to be measured, and the overall systems delay will be what is crucial in the simulation validation effort. For the GTRS simulation effort, the main computer cycle time was between 70 and 80 msec; this was compared with measurements of the XV-15 control system, which will be discussed in the next section. As a result, the decision was made to turn off the mathematically modeled control lags and hysteresis effects that were programmed into the simulation.

One of the easiest and most effective methods to use in running overall system verification checks is to evaluate the frequency response of the transfer function of interest. The end-to-end computer verification results using this method can be added easily to the motion and visual system frequency responses in order to obtain an overall simulator response for verification with the actual aircraft. Tischler, in Refs. 20 and 21, helped to support the mathematical model verification effort by conducting an end-to-end check of the mathematical model by inputting frequency sweeps through the cab controls. The results for hover were subsequently compared with flight test data obtained following the simulation. In Ref. 22, this same type of analysis technique was used with a UH-60A Black Hawk to evaluate and compare flight test, mathematical model, and, more importantly, simulator cab response. More discussion on this experiment will follow later in this section.

B. SIMULATION CAB CONTROL SYSTEMS

Control system verification is the second important step in the end-to-end systems verification process. Force-feel control system verification was conducted by comparing the measured XV-15 force feel system frequency response with that which was generated using the VMS cab McFadden control loaders. Adjustments were made subsequently to the force gradient and damping characteristics until the best possible match was obtained. The pilot response to the simulated XV-15 control system was excellent.

The mechanical control system of the XV-15 was also measured end to end, and frequency responses were obtained for the various segments of this system. Figure 26 presents the results from the measurement of the lateral stick response. This data was subsequently modeled as a first-order lag in the XV-15 mathematical model control system. However, as was stated previously, the decision was made not to include this effect, because the phase decrement due to the computer cycle time (ΔT effect), the mathematical model, and other parts of the simulation system were known to be considerably greater than those measured on the XV-15.

C. THE SIMULATION VISUAL, MOTION, AND AURAL SYSTEMS

The simulation systems are those that must provide the visual, motion, and aural cueing to the pilot so that he perceives that he is flying an exact replica of the actual vehicle of interest. Careful end-to-end verification of the effects of these systems is critical to quantification of simulation validation. Large lags (or leads) in these systems, especially if the systems are not in phase, can considerably reduce simulation bandwidth and compromise simulation results for highly aggressive simulation tasks (e.g., NOE flight tasks). Reference 22 presents results quantifying these types of problems.

The early development of the XV-15 was conducted using the Flight Simulator for Advanced Aircraft (FSAA), which is located in an adjoining building to the VMS. The visual system used with the FSAA provides both the pilot and co-pilot

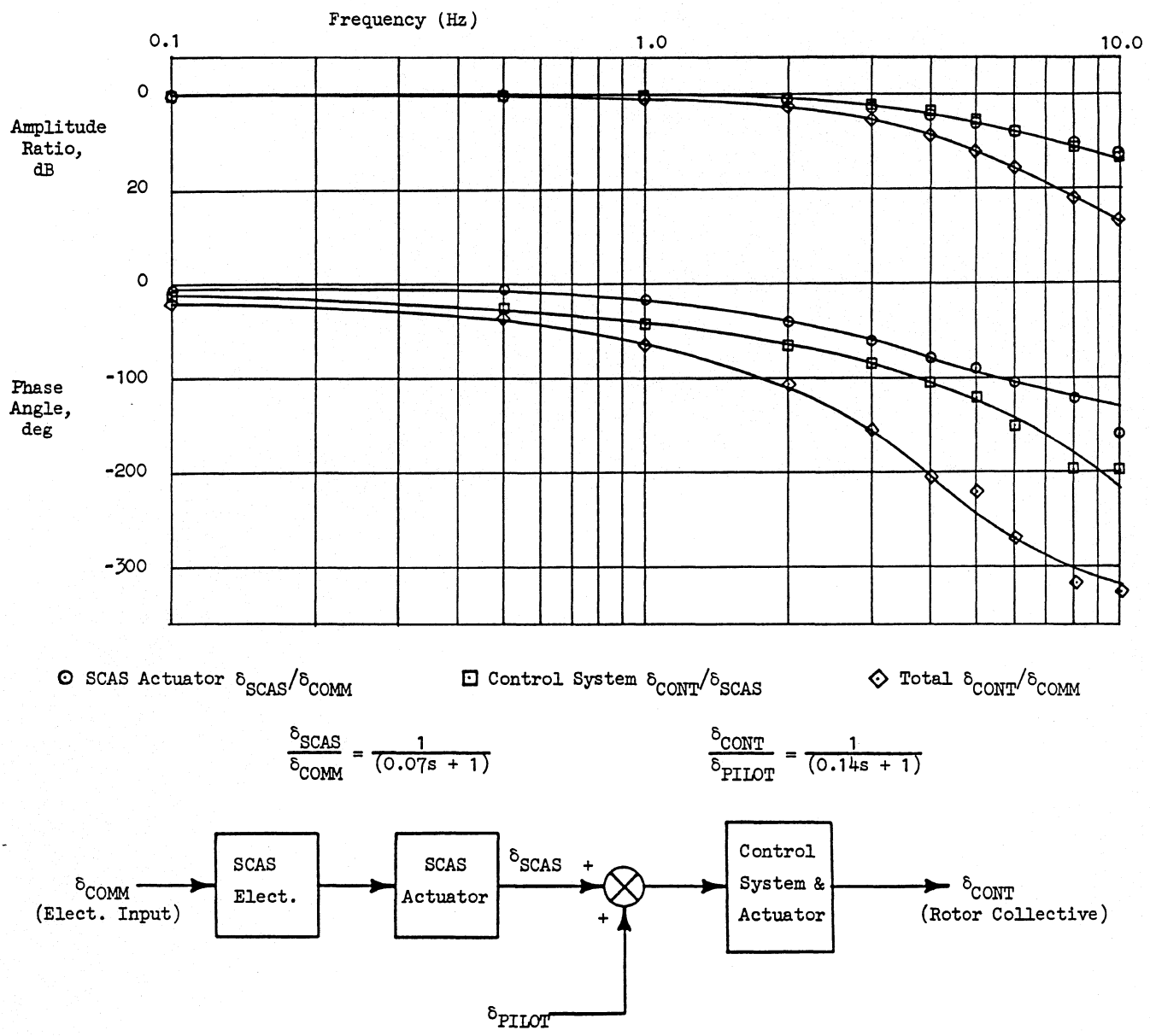


Figure 26. Measured XV-15 (S/N 703) Lateral Control Response Characteristics

with one forward-facing window that is driven by a Redifon (TV) system traveling over a terrain board. Results discussed in Ref. 1 show how an unexplained delay in the Redifon system was responsible for "pushing the pilot over the PIO cliff" on the roll axis in a shipboard landing task using the XV-15. These results are

reproduced in Fig. 27. The XV-15 can be seen (in flight) to be marginally PIO prone on the roll axis in hover (which is backed up by pilot evaluation), by not clearly meeting precision attitude control lag limit criterion (Ref. 18). The measured pilot-control-to-visual-system response, indicated by the triangles, is clearly unacceptable, and the simulation pilot's evaluation comments clearly backed this up. With the Redifon system, however, it is possible to negate this visual effect by introducing lead into the camera drive system. This was done in the simulation by adding a 0.23 sec lead to the normal 0.22 sec lead in order to obtain a phase relationship between the pilot and visual that much more closely matched that of the predicted XV-15 characteristics (Fig. 28). The pilot's response to this was that it fixed the simulator; unfortunately, it didn't fix the XV-15. However, this was done later.

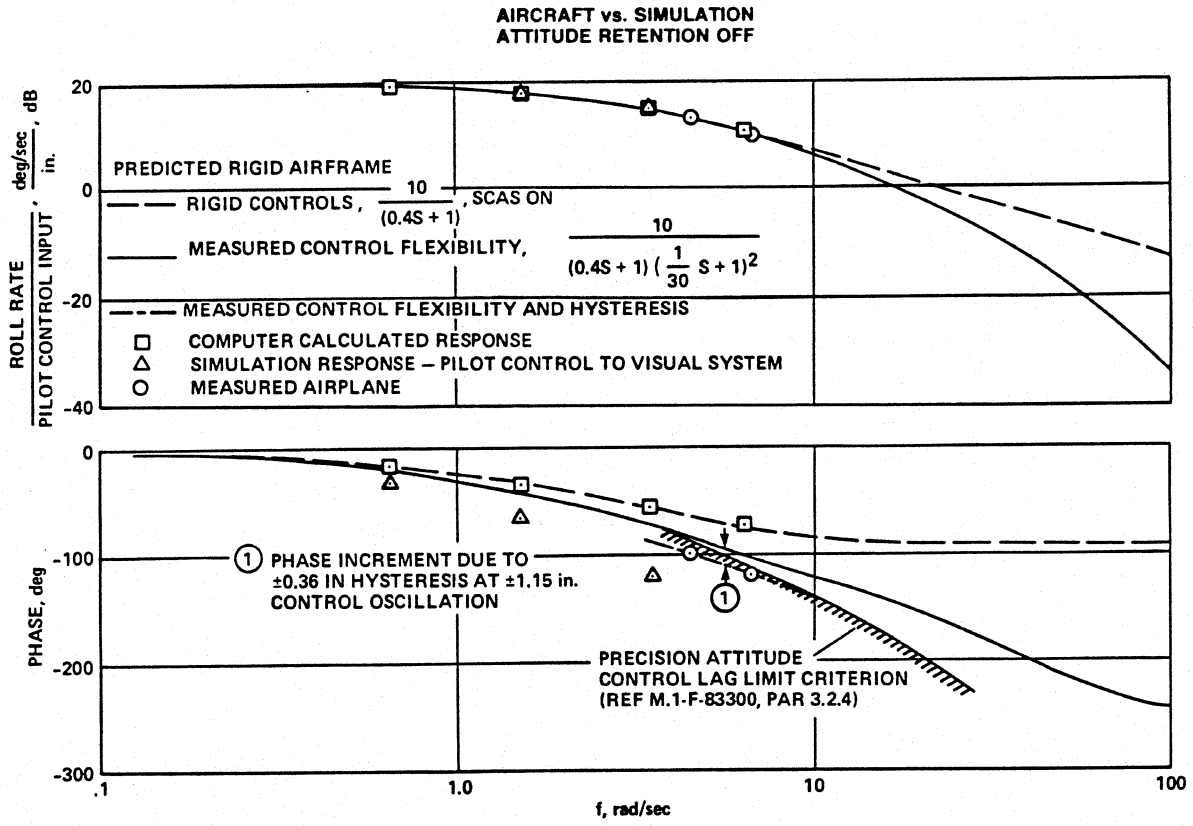


Figure 27. XV-15 Aircraft Versus Simulation Hover Roll Response

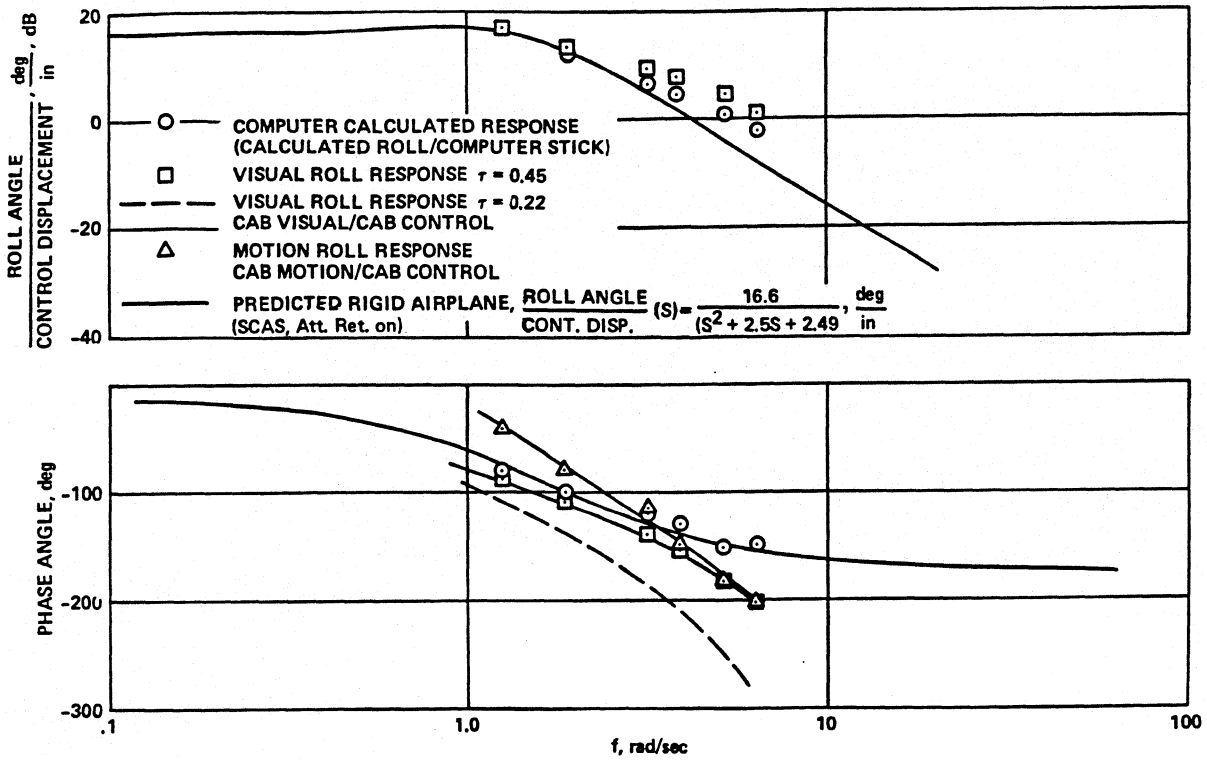


Figure 28. XV-15 Simulator Roll Response

The VMS, unlike the FSAA, uses a Singer-Link four-window computer-generated image (CGI) visual display. This CGI display provides a much better field of view to the pilot (more like a real cockpit) and eliminates the "port hole" or "tunnel-vision" constraints of the Redifon system. However, in return for the increased field of view and some increased visual resolution, scene content (or detail) and some parallax cues are sacrificed because of hardware constraints. A pure time delay is also introduced into the visual scene due to computer hardware and software processing constraints. This delay, measured by Paulk using the Xerox Sigma host computer (Ref. 23), is approximately $\Delta T = 1.53\ DT + 91.5$ (where DT is the main computer cycle time). For the XV-15 simulation, depending on which host computer is used, the time delay is approximately 110 to 180 msec. This equates (worst case) to approximately

approximately 110 to 180 msec. This equates (worst case) to approximately 10.3 deg of phase distortion at 1 rad/sec and 31 deg at 3 rad/sec ($\phi = -(\omega)(\Delta T)(57.3)$. This presents a potentially significant problem, because this level of phase distortion will reduce the already low bandwidth (in comparison to a helicopter) of approximately 2.5 rad/sec for the XV-15 to a lower bandwidth of 1.5 rad/sec (Fig. 29). For mission task elements that are not highly aggressive, this is still acceptable, but for NOE flight or for shipboard landing tasks, even though the pilot can add lead, the results may not be indicative of those that are found or will be found in the real aircraft, and pilot performance will be poor by comparison.

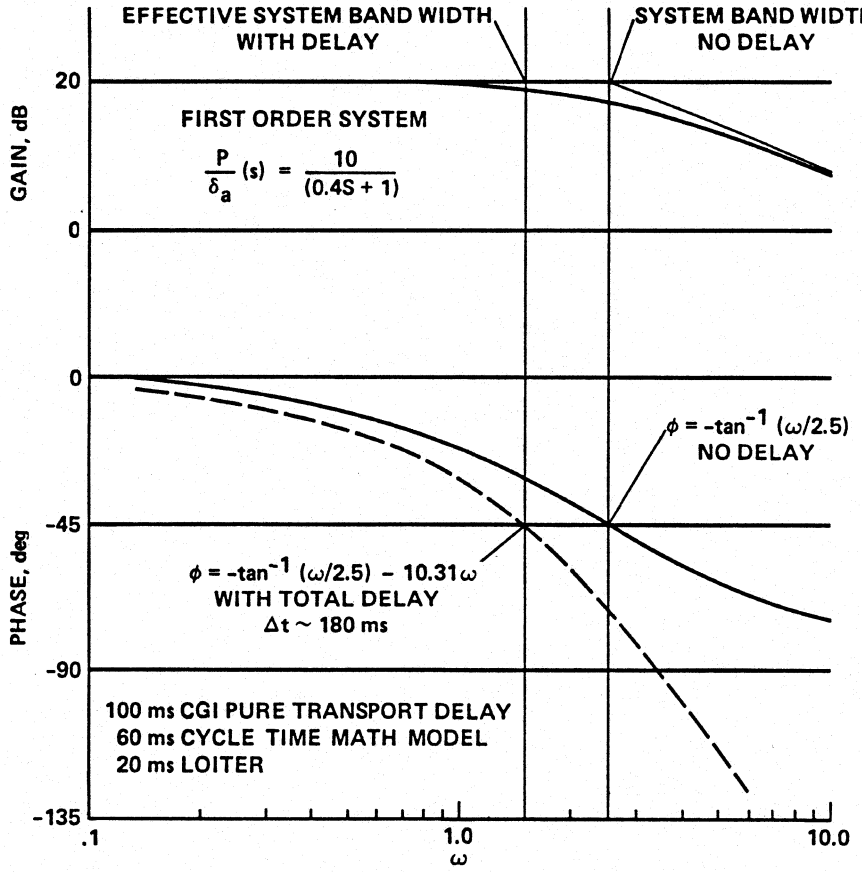


Figure 29. Effects of Total Simulation System Delay Time

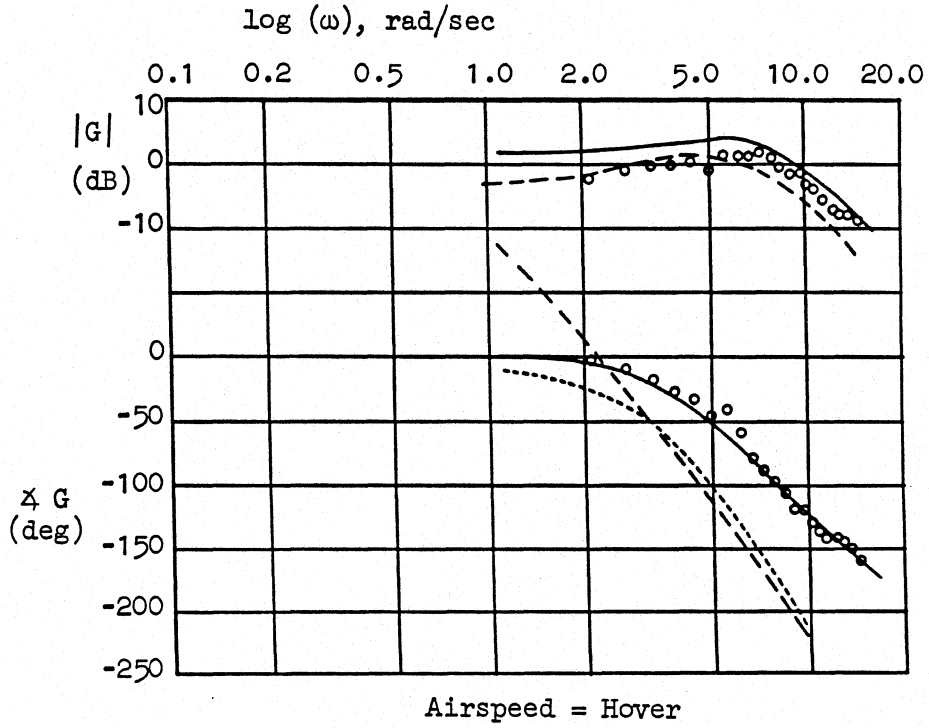
Motion system verification is also very important, and, if the motion is not tuned carefully with respect to the visual, the subject pilots can become nauseous and disoriented. Unfortunately, a detailed accounting and quantification of all cab linear and angular motion transfer functions was not made during the simulation effort due to time constraints. Reference 24 presents some limited results that were obtained. (It should be noted that this motion system was replaced by a new system during the VMS renovation that was completed during the period between 1986 and 1988.)

If it can be assumed that the UH-60A Black Hawk roll transfer function data presented in Ref. 22 is close to that which would have been measured with a gyro in the XV-15 cab, it can be seen in Fig. 30 that the cab roll response and the CGI visual would be in good agreement at high frequency, $\omega > 2.5$ rad/sec. In the range below 2.5 rad/sec, the visual lag, as discussed before, will still contribute to a lower system bandwidth, while the phase of the motion will begin to significantly lead the visual and the mathematical model. The lead in the cab response is generated by a second-order linear washout of the form:

$$G(s) = \frac{Ks^2}{s^2 + 2\zeta\omega_n s + \omega_n^2}$$

This form of washout is required if the motion system is to be capable of recentering itself prior to each new series of motion commands. Conclusions drawn from Ref. 22 yield the hypothesis at the present time that, for aggressive NOE tasks, this phase relationship will result in pilot cueing confusion and decreased pilot performance.

The aural system, while not used for cueing in the same way as the visual or motion systems, is important to the pilot's perceived fidelity. Some cues are very often obtained by the pilot through the aural mode, e.g., the pilot knows when the pylons have rotated to the stops or that the flaps or landing gear are moving by the particular sounds associated with these mechanical



$$G(s) = \frac{P}{\delta_{LAT}} \text{ (deg/sec/\%)}$$

Figure 30. UH-60A and Simulator p/δ_{LAT} Hover Transfer Function Comparisons

movements. This helps to reduce pilot workload and induce a realism to the simulation. Sansom discusses the results of the effect to simulate the aural effects of the XV-15 from flight data in Ref. 25.

In concluding this brief discussion of simulation systems verification, several statements can be made based on XV-15 simulation experience (as pertains mainly to the VMS hardware configuration existing during the 1983 to 1984 time frame).

- It is crucial to have quantification for *all* of the simulation system response characteristics on hand prior to the evaluation of simulation results. All too often, researchers, including the author, have not obtained this information and have subsequently paid a penalty when trying to better understand results obtained without it.

- More research needs to be conducted to improve CGI visual phase distortion for low-bandwidth vehicle simulations without producing significant gain distortion (if possible). While the Redifon was capable of being adjusted to reduce the phase distortion, its limited field of view precludes evaluations of anything other than "straight ahead" tasks.

- The effects of large motion phase leads on pilot performance need to be better quantified and documented, especially for low-bandwidth systems.

SECTION VI

SIMULATION FIDELITY

As stated earlier in this report, simulation fidelity is a measure of the pilot's perception with respect to the accuracy of the simulation to induce correct pilot responses. This measure is affected by all elements of the simulation for which verification is possible, as well as those aspects that are not verifiable (e.g., scene content or detail of the visual).

Examples of the effects related to the mathematical model that improved pilot fidelity were the modifications of the in-ground effect model and the pylon conversion aerodynamics. These examples, based on pilot comments, indicate the importance of fully defining the simulation modeling requirements as a function of the tasks of interest so that small but important effects are included. The lack of these effects can ultimately contribute to enough cues being "lost" that the simulated system bandwidth is lowered and pilot acceptance is reduced.

A large percentage of the pilot's perceptual fidelity requirements are presented through the visual modality. As discussed previously, the ΔT effects of the CGI hardware, software, and related host computer integration requirements limit pilot performance at high frequency. At lower frequencies, however, a whole new set of fidelity issues can arise. Visual requirements not affected by ΔT requirements include scene content or detail, parallax cues, texture, resolution, and range and closure rate cues or what many pilots call "a sense of depth perception." While some of these requirements overlap, there seems to be a need for at least a small amount of all of them in a good visual scene.

The appropriate cockpit field of view for the task of interest is also a primary requirement for providing fidelity. If the needed cues are not capable of being presented (no matter how poor they might be), the pilot certainly cannot

be expected to perform the task. Bray discusses the effect of simulation field of view using photographs in Ref. 24. Future wide-angle "out of cockpit" visual projection systems, like the Rediffusion CT6 system, provide the best hope for improvement of this problem.

Scene content and texture are important in providing the pilot with enough objects to maintain a position (e.g., when hovering). However, if the resolution of the objects or the parallax cues in the scene are poor (e.g., they have blurred edges or there is a lack of objects at varying ranges), the number of objects may still not be capable of providing adequate visual cues. An example of how small visual improvements can provide increased fidelity was recently demonstrated on a Navy shipboard landing simulation at NASA ARC and in a flight test experiment (Ref. 26). Pilots simulating flight in the vicinity of a destroyer had previously complained of inadequate cues for approach and landing. While options for improvement were severely limited, a way was found to include the figure of a man in the landing scene and a group of large "ice cubes" (representing ice floes) in the monotone blue ocean scene. As the destroyer moved through the ice floes (fixed in position in the inertial sense), the pilot approaching the ship was able to obtain greatly improved closure rate and hovering cues. The improved scene content and scaling effect provided by the figure of a man on deck helped the pilot to better perceive the range to the ship. Had the CGI hardware also allowed for deck texture and the addition of small, randomly space, irregularly sized, high resolution objects to the scene, then even more improved visual fidelity would have been expected. These same types of cueing problems are present in NOE scenes, as evidenced by the pilot comments in Ref. 22. In the flight test experiment of Ref. 26, visual cues were degraded to represent a quality comparable to those contained in the simulation, and the pilots had a much harder time hovering a real helicopter. In conclusion, while the CGI system has eliminated the "tunnel vision" of the Redifon (which

did provide good fidelity for straight-ahead tasks such as approach and landing) by increasing field of view, it has, in general, sacrificed visual parameters, such as scene content, texture, and visual update rate.

Overall, for the majority of the tilt-rotor evaluation tasks, the fidelity of the VMS as a complete system was quite good. However, if the VMS is to be used extensively for high-bandwidth tasks (e.g., shipboard landing, NOE flight, air-to-air combat) during the MV-22 or the Army's Light Helicopter Experimental (LHX) simulation programs, problems may continue to persist when quantifying simulation fidelity and evaluating engineering design trade-offs. Also, if pilot evaluations are conducted to evaluate handling qualities in conjunction with combat tasks, such as navigation, communication, or battle captain duties, then the increased workload expected of these tasks may be more than sufficient to lower the pilot's control bandwidth to the point where aggressive maneuvering in the VMS may be considerably more difficult than the equivalent real-world task.

SECTION VII

CONCLUSIONS AND RECOMMENDATIONS

In summarizing the generic tilt-rotor validation effort, several conclusions can be stated with a high level of confidence. The *foremost of these conclusions* is that the VMS and FSAA simulators are good tools for tilt-rotor and rotorcraft design, development, and pilot training. Like most man-made tools, confidence in the VMS (and FSAA) is highly dependent on the way in which it is utilized by researchers involved with a particular project. In validating the generic tilt-rotor simulation as a complete system, several important verification statements or lessons can be provided. These include:

1. *Mathematical Model Verification*--The GTRS mathematical model is capable of providing the required tilt-rotor dynamic response characteristics required for simulation of most tilt-rotor tasks of interest. This is demonstrated by the results presented in this report. Some of the weaknesses that do exist in the mathematical model were identified during the validation simulation and, as a result, are being addressed in a follow-on mathematical model improvement effort. A capability is also being developed for future use that will better quantify and verify in a usable format (e.g., the frequency domain) the dynamic response characteristics of configurations being evaluated with the GTRS program.

2. *Visual System Verification*--The Redifon (TV) visual system provides adequate bandwidth for tilt-rotor simulation (assuming it is "tuned up" appropriately), but "tunnel vision" limits aggressive pilot task evaluation, especially for tasks requiring wide angle cockpit field of view. The CGI visual system, while eliminating "tunnel vision" problems, is deficient in other areas, such as scene content, texture, and, most importantly, in acceptable performance at higher frequencies (due to ΔT lags) where aggressive piloting tasks (e.g.,

NOE maneuvers) require the maximum mathematical model bandwidth. Further research is required to understand the limitations of the CGI system in order to maximize its usefulness and specify modifications to enhance future performance.

3. *Motion System Verification*--Motion system cues are important, and the phase of the motion system must complement the visual system, or the pilot will become sick. At the present time, however, not enough is known about the use of motion to specify clearly the optimum set of motion system drive parameters to maximize perceived pilot fidelity for any arbitrary series of tilt-rotor tasks. While specific task requirements have been investigated in some cases, this work is not complete nor documented well enough for future needs, especially for tasks conducted in the region of mid- to low-frequency, where significant motion lead is encountered.

4. *Total Systems Verification*--This part of the validation process is the most important, because the "sum of the parts" can often yield lower performance than that which would be expected. Techniques, software, and hardware to quantify this performance need to be developed further, and they need to be provided in the VMS and FSAA for verification and diagnostic use (e.g., user-friendly software for frequency response quantification, a calibrated, cab-installed, three-axis rate gyro and accelerometer package). Cab control loader and aural system verification should be given higher priority in simulation setup by researchers in order to maximize pilot perceived fidelity.

5. *Pilot Perceived Fidelity*--Pilot perceptual fidelity evaluation procedures are the most significant deficiency of the simulation "art." Perceptual fidelity evaluations are invalid without first obtaining an engineering fidelity assessments that are obtained through equipment and mathematical model response evaluations. Further, the use of simulation for developing specification or certification criteria is invalid without first validating the entire simulation system.

Recommendations as a result of this project are simply stated as:

1. Identified weaknesses of the GTRS mathematical model should be corrected or researched to quantify the individual effects on simulation fidelity further. Also, correlation with all types of XV-15 flight test data should be pursued aggressively.

2. Identified visual, motion, and aural system weaknesses should likewise be eliminated wherever possible. This will require hardware upgrades as well as software improvements.

3. After a reasonable period of time, all of the improvements in software and hardware should, as a new simulation system, again be evaluated in a comprehensive simulation validation effort.

Accomplishments of these three tasks will provide a new reference baseline from which to evaluate the state of the art in piloted tilt-rotor simulation. From this new baseline, further improvements can be developed and implemented as required to meet ever changing simulation requirements.

All of this simulation effort--in that it accomplishes specific objectives in simulation validation and sets goals for future improvements to the simulation--has a significant effect on future tilt-rotor development programs; that is, there is confidence in the pilots and engineers that a maximum effort is being made to *validate* the design and handling qualities of future tilt-rotor aircraft so as to *safely* advance tilt-rotor technology for civil and military applications.

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APPENDIX A

XV-15 PERFORMANCE AND STABILITY AND CONTROL DATA

DATA SUMMARY

The calculated performance and stability and control data presented in this appendix is provided as reference information to anyone interested in the level flight capabilities of the BHT XV-15. The data can roughly be compared with the data contained in Ref. A-1. Several parameters have been changed, however, to more closely represent the S/N 703 XV-15 configuration presently in flight test (i.e., helicopter and airplane mode rotor speeds that are used are 589 and 517 RPM, respectively. In Ref. A-1, the rotor speeds used were 601 and 458 RPM. These were the "planned" values before XV-15 flight tests began.)

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XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	0.0 degrees
Nacelle Incidence	=	90.0 degrees
Rotor Speed	=	589.0 RPM
Flap/Flaperon Position	=	40/25 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	0, 20, 40, 60, 80, 100 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT = 0.01 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	0.1000E-01	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.4319E-02	-.2806E-15	0.5422E-02

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	0.9998E-02	0.0000E+00	0.1937E-03	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.3663E-16	-.4366E-01	-.1567E-14

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		0.00
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		0.00
ANGLE OF ATTACK (DEG)		1.110
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		1.110
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5280E+05	S.L.	301.2
IXZ	1234.	B.L.	0.0000E+00
IYY	0.2136E+05	W.L.	81.65
IZZ	0.6634E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	6.9319	69.32
LONG	(FWD)	5.2702	54.90
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	990.7	8834.	3.801	771.0	0.6906
RIGHT	990.7	8834.	3.801	771.0	0.6906
ENGINE	1075.				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	47.0917	47.0917
B1	0.9874	0.9874
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	2.2264
AILERON	0.0000
RUDDER	0.0000

ROTOR FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	3.0935	-0.9617	-0.2085	7333.92	-125.09	-29.16	99.22
RIGHT	3.0935	-0.9617	-0.2085	7333.92	-125.09	-29.16	99.22

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.0000	0.0000	52.6213	0.0682	0.001019	0.010574	0.026391
RIGHT	0.0000	0.0000	52.6213	0.0682	0.001019	0.010574	0.026391

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03020	0.01602	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03020	0.01602				

TIME USED FOR THIS TRIM = 0.0077 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 0.01 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	0.000	0.000	0.000	0.000	0.000	0.000
WING						
LEFT WING	-0.002	0.000	872.479	-9394.661	399.999	-0.022
RIGHT WING	-0.002	0.000	872.479	9394.661	399.999	0.022
FREESTREAM	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	-0.004	0.000	1744.957	0.000	799.997	0.000
ENGINE PYLONS	-0.014	0.000	113.730	0.000	-11.353	0.000
HORIZ. STAB.	0.000	0.000	0.000	0.000	0.000	0.000
VERT. STAB.						
FIN NO. 1	0.000	0.000	0.000	0.000	0.000	0.000
FIN NO. 2	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	0.000	0.000	-99.217	1595.746	9.922	0.000
RIGHT ENG	0.000	0.000	-99.217	-1595.746	9.922	0.000
TOTAL	0.000	0.000	-198.435	0.000	19.844	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-0.018	0.000	1660.252	0.000	808.489	0.000
ROTOR						
LEFT ROTOR	125.073	-98.836	-7333.310	117975.945	-412.057	-6817.248
RIGHT ROTOR	125.073	98.836	-7333.310	-117975.945	-412.057	6817.248
HUB SPINNER	-0.001	0.000	6.582	0.000	-0.650	0.000
TOTAL ROTOR	250.145	0.000	-14660.037	0.000	-824.764	0.000
TOTAL AIRCRAFT (BODY AXIS)	250.127	0.000	-12999.785	0.000	-16.276	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-1.702	0.000	-2.224	0.000	-16.276	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52795.0, IYY = 21360.0, IZZ = 66335.0, DRIVEI = 824.0 SLUG-FT2

****
*** VT = 0.01 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.7328	0.0000	-0.4298	0.0000	0.1606	0.0000
	ROTOR	0.0000	-1.7328	0.0000	-0.5462	0.0000	0.1606	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1164	0.0000	0.0000	0.0000
Q	TOTAL	1.7854	0.0000	-0.3666	0.0000	-0.3017	0.0000	-0.8675
	ROTOR	1.7848	0.0000	-0.4205	0.0000	-0.2986	0.0000	-0.8675
	AIRFRM	0.0006	0.0000	0.0538	0.0000	-0.0031	0.0000	0.0000
R	TOTAL	0.0000	-0.6060	0.0000	0.0787	0.0000	-0.0223	0.0000
	ROTOR	0.0000	-0.6138	0.0000	0.0871	0.0000	-0.0212	0.0000
	AIRFRM	0.0000	0.0077	0.0000	-0.0084	0.0000	-0.0011	0.0000
U	TOTAL	-0.0112	0.0000	-0.0388	0.0000	0.0013	0.0000	0.0262
	ROTOR	-0.0069	0.0000	-0.0337	0.0000	0.0010	0.0000	0.0262
	AIRFRM	-0.0043	0.0000	-0.0051	0.0000	0.0003	0.0000	0.0000
V	TOTAL	0.0000	-0.0205	0.0000	-0.0038	0.0000	0.0012	0.0000
	ROTOR	0.0000	-0.0189	0.0000	-0.0039	0.0000	0.0012	0.0000
	AIRFRM	0.0000	-0.0016	0.0000	0.0001	0.0000	0.0001	0.0000
W	TOTAL	0.0027	0.0000	-0.2165	0.0000	-0.0003	0.0000	-0.0005
	ROTOR	0.0026	0.0000	-0.2029	0.0000	0.0001	0.0000	-0.0005
	AIRFRM	0.0001	0.0000	-0.0136	0.0000	-0.0005	0.0000	0.0000
RPM	TOTAL	0.0195	0.0000	-1.0473	0.0000	0.0007	0.0000	1.0157
	ROTOR	0.0195	0.0000	-1.1769	0.0000	-0.0005	0.0000	1.0157
	AIRFRM	0.0000	0.0000	0.1296	0.0000	0.0012	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0916	0.0000	-4.6819	0.0000	0.0012	0.0000	0.0554
	ROTOR	0.0916	0.0000	-5.2205	0.0000	-0.0039	0.0000	0.0554
	AIRFRM	0.0000	0.0000	0.5386	0.0000	0.0051	0.0000	0.0000
XTHEG	TOTAL	0.0559	0.0000	-2.9264	0.0000	0.0009	0.0000	2.7837
	ROTOR	0.0559	0.0000	-3.2631	0.0000	-0.0023	0.0000	2.7837
	AIRFRM	0.0000	0.0000	0.3367	0.0000	0.0032	0.0000	0.0000
XLN	TOTAL	1.3165	0.0000	-0.0304	0.0000	-0.1973	0.0000	0.0251
	ROTOR	1.3165	0.0000	-0.0331	0.0000	-0.1973	0.0000	0.0251
	AIRFRM	0.0000	0.0000	0.0026	0.0000	0.0000	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0275	0.0000	0.2358	0.0000	-0.0181	0.0000
	ROTOR	0.0000	-0.0275	0.0000	0.2510	0.0000	-0.0181	0.0000
	AIRFRM	0.0000	0.0000	0.0000	-0.0152	0.0000	0.0000	0.0000
XPD	TOTAL	0.0000	0.2340	0.0000	0.0170	0.0000	0.0989	0.0000
	ROTOR	0.0000	0.2340	0.0000	0.0171	0.0000	0.0989	0.0000
	AIRFRM	0.0000	0.0000	0.0000	-0.0001	0.0000	0.0000	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT = 20.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	33.76	0.0000E+00	0.1490E-07
ACCEL	(FPS2)	-.5643E-04	-.2573E-06	-.5381E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	33.76	-.2482E-08	0.2422	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.2807E-05	-.5593E-02	-.1065E-05

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	20.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	1.35
ANGLE OF ATTACK	(DEG)	0.411
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	0.411
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5280E+05
IXZ	1234.
IYY	0.2136E+05
IZZ	0.6634E+05

CENTER OF GRAVITY (IN)

S.L.	301.2
B.L.	0.0000E+00
W.L.	81.65

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	6.6284	66.28
LONG	(FWD)	5.3847	56.09
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	928.7	8281.	3.572	804.8	0.7208
RIGHT	928.7	8281.	3.572	804.8	0.7208
ENGINE	1009.				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	46.3773	46.3773
B1	1.2278	1.2278
A1	0.0000	0.0000

ROTOR — FLAPPING — FORCES - MAST AXIS — JET

	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	3.0238	-1.0237	3.9601	7112.04	-109.86	196.00	83.51
RIGHT	3.0238	-1.0237	3.9601	7112.04	-109.86	196.00	83.51

SURFACE POSITIONS (DEG)

ELEVATOR	2.7683
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.0073	0.0438	51.9495	0.0670	0.000955	0.010254	0.023668
RIGHT	0.0073	0.0438	51.9495	0.0670	0.000955	0.010254	0.023668

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02430	0.01387	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02430	0.01387				

TIME USED FOR THIS TRIM = 0.0108 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 20.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-3.426	0.000	-10.320	0.000	-71.752	0.000
WING						
LEFT WING	-11.276	0.000	687.902	-7848.261	432.303	-128.646
RIGHT WING	-11.276	0.000	687.902	7848.261	432.303	128.646
FREESTREAM	-39.834	0.000	-105.203	-0.003	-5.808	0.000
TOTAL	-62.386	0.000	1270.602	-0.003	858.797	0.000
ENGINE PYLONS	-48.464	0.000	118.990	0.000	62.210	0.000
HORIZ. STAB.	-1.525	0.000	-11.216	0.000	-239.174	0.000
VERT. STAB.						
FIN NO. 1	-0.602	0.000	0.000	0.000	1.708	-3.863
FIN NO. 2	-0.602	0.000	0.000	0.000	1.708	3.863
TOTAL	-1.204	0.000	0.000	0.000	3.415	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	0.000	0.000	-83.512	1343.149	8.351	0.000
RIGHT ENG	0.000	0.000	-83.512	-1343.149	8.351	0.000
TOTAL	0.000	0.000	-167.024	0.000	16.703	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-117.005	0.000	1201.033	-0.003	630.199	0.000
ROTOR						
LEFT ROTOR	109.840	-320.088	-7107.540	112017.742	-344.561	-6532.596
RIGHT ROTOR	109.840	320.088	-7107.540	-112017.742	-344.561	6532.595
HUB SPINNER	-9.405	0.000	14.407	0.000	56.837	0.000
TOTAL ROTOR	210.274	0.000	-14200.673	0.000	-632.285	-0.001
TOTAL AIRCRAFT (BODY AXIS)	93.269	0.000	-12999.640	-0.003	-2.086	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.023	0.000	0.026	-0.003	-2.086	-0.001

STABILITY DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52795.0, IYY = 21360.0, IZZ = 66335.0, DRIVEI = 824.0 SLUG-FT2

*** VT = 20.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.3641	0.0000	-0.5305	0.0000	0.1709	0.0000
	ROTOR	0.0000	-1.1960	0.0000	-0.5718	0.0000	0.1526	0.0000
	AIRFRM	0.0000	-0.1682	0.0000	0.0412	0.0000	0.0183	0.0000
Q	TOTAL	1.5738	0.0000	-0.1750	0.0000	-0.6355	0.0000	-1.1598
	ROTOR	1.5708	0.0000	0.5133	0.0000	-0.2697	0.0000	-1.1598
	AIRFRM	0.0030	0.0000	-0.6884	0.0000	-0.3658	0.0000	0.0000
R	TOTAL	0.0000	0.2063	0.0000	0.3517	0.0000	-0.1430	0.0000
	ROTOR	0.0000	-0.6402	0.0000	0.2861	0.0000	-0.0215	0.0000
	AIRFRM	0.0000	0.8466	0.0000	0.0657	0.0000	-0.1216	0.0000
U	TOTAL	-0.0278	0.0000	-0.1733	0.0000	-0.0008	0.0000	0.0145
	ROTOR	-0.0057	0.0000	-0.0942	0.0000	0.0010	0.0000	0.0145
	AIRFRM	-0.0221	0.0000	-0.0791	0.0000	-0.0018	0.0000	0.0000
V	TOTAL	0.0000	-0.0540	0.0000	-0.0045	0.0000	0.0079	0.0000
	ROTOR	0.0000	-0.0066	0.0000	-0.0034	0.0000	0.0034	0.0000
	AIRFRM	0.0000	-0.0474	0.0000	-0.0012	0.0000	0.0045	0.0000
W	TOTAL	0.0153	0.0000	-0.2900	0.0000	-0.0088	0.0000	-0.0005
	ROTOR	0.0083	0.0000	-0.2120	0.0000	-0.0007	0.0000	-0.0005
	AIRFRM	0.0069	0.0000	-0.0780	0.0000	-0.0081	0.0000	0.0000
RPM	TOTAL	0.0252	0.0000	-0.9475	0.0000	-0.0009	0.0000	0.9353
	ROTOR	0.0232	0.0000	-1.0860	0.0000	-0.0013	0.0000	0.9353
	AIRFRM	0.0020	0.0000	0.1384	0.0000	0.0004	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0566	0.0000	-4.5981	0.0000	0.0040	0.0000	0.1182
	ROTOR	0.0480	0.0000	-5.2223	0.0000	0.0029	0.0000	0.1182
	AIRFRM	0.0086	0.0000	0.6242	0.0000	0.0011	0.0000	0.0000
XTHEG	TOTAL	0.0141	0.0000	-2.8872	0.0000	0.0041	0.0000	2.7182
	ROTOR	0.0087	0.0000	-3.2797	0.0000	0.0034	0.0000	2.7182
	AIRFRM	0.0054	0.0000	0.3925	0.0000	0.0007	0.0000	0.0000
XLN	TOTAL	1.2880	0.0000	0.2535	0.0000	-0.2219	0.0000	-0.3440
	ROTOR	1.2902	0.0000	0.3639	0.0000	-0.1946	0.0000	-0.3440
	AIRFRM	-0.0022	0.0000	-0.1104	0.0000	-0.0273	0.0000	0.0000
XLT	TOTAL	0.0000	-0.1397	0.0000	0.2438	0.0000	-0.0208	0.0000
	ROTOR	0.0000	-0.1397	0.0000	0.2445	0.0000	-0.0196	0.0000
	AIRFRM	0.0000	0.0000	0.0000	-0.0008	0.0000	-0.0012	0.0000
XPD	TOTAL	0.0000	0.1753	0.0000	-0.0188	0.0000	0.1091	0.0000
	ROTOR	0.0000	0.2396	0.0000	-0.0198	0.0000	0.1004	0.0000
	AIRFRM	0.0000	-0.0643	0.0000	0.0010	0.0000	0.0087	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT = 40.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	67.51	0.0000E+00	-.2384E-06
ACCEL	(FPS2)	-.2285E-03	-.5533E-07	0.1083E-02

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	67.45	-.1105E-07	-2.967	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.7402E-05	-.3958E-01	0.2104E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		40.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		5.42
ANGLE OF ATTACK (DEG)		-2.519
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-2.519
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5280E+05	S.L.	301.2
IXZ	1234.	B.L.	0.0000E+00
IYY	0.2136E+05	W.L.	81.65
IZZ	0.6634E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	5.0673	50.67
LONG	(FWD)	5.0691	52.80
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	642.0	5725.	3.363	838.5	0.7511
RIGHT	642.0	5725.	3.363	838.5	0.7511
ENGINE	700.4				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	43.6703	43.6703
B1	0.5651	0.5651
A1	0.0000	0.0000

ROTOR FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.7050	-0.1520	5.7423	6097.19	24.56	260.70	51.34
RIGHT	2.7050	-0.1520	5.7423	6097.19	24.56	260.70	51.34

SURFACE POSITIONS (DEG)	
ELEVATOR	1.2741
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	-0.0047	0.0875	35.4892	0.0498	0.000660	0.008791	0.019481
RIGHT	-0.0047	0.0875	35.4892	0.0498	0.000660	0.008791	0.019481

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01852	0.01257	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01852	0.01257				

TIME USED FOR THIS TRIM = 0.0178 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT = 40.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-15.850	0.000	-26.143	0.000	-598.516	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-350.068	0.000	-719.309	-0.001	451.962	0.000
TOTAL	-350.068	0.000	-719.309	-0.001	451.962	0.000
ENGINE PYLONS	-97.506	0.000	86.379	0.000	140.465	0.000
HORIZ. STAB.	-3.860	0.000	-75.388	0.000	-1618.995	0.000
VERT. STAB.						
FIN NO. 1	1.114	0.000	0.000	0.000	-3.159	7.147
FIN NO. 2	1.114	0.000	0.000	0.000	-3.159	-7.146
TOTAL	2.227	0.000	0.000	0.000	-6.318	0.001
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	0.000	0.000	-51.336	825.654	5.134	0.000
RIGHT ENG	0.000	0.000	-51.336	-825.654	5.134	0.000
TOTAL	0.000	0.000	-102.672	0.000	10.267	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-465.057	0.000	-837.132	-0.001	-1621.135	0.001
ROTOR						
LEFT ROTOR	-24.558	-367.068	-6091.711	94905.023	627.223	-6157.025
RIGHT ROTOR	-24.558	367.068	-6091.711	-94905.023	627.223	6157.026
HUB SPINNER	-57.326	0.000	32.686	0.000	351.934	0.000
TOTAL ROTOR	-106.442	0.000	-12150.737	0.000	1606.380	0.001
TOTAL AIRCRAFT (BODY AXIS)	-571.499	0.000	-12987.869	-0.001	-14.755	0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.111	0.000	-0.433	-0.001	-14.755	0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52795.0, IYY = 21360.0, IZZ = 66335.0, DRIVEI = 824.0 SLUG-FT2

*** VT = 40.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6395	0.0000	-0.8131	0.0000	0.1057	0.0000
	ROTOR	0.0000	-0.7950	0.0000	-0.6910	0.0000	0.1267	0.0000
	AIRFRM	0.0000	0.1555	0.0000	-0.1221	0.0000	-0.0210	0.0000
Q	TOTAL	1.4674	0.0000	-0.8490	0.0000	-0.8877	0.0000	-0.4006
	ROTOR	1.4033	0.0000	0.6957	0.0000	-0.2483	0.0000	-0.4006
	AIRFRM	0.0641	0.0000	-1.5448	0.0000	-0.6394	0.0000	0.0000
R	TOTAL	0.0000	-1.2069	0.0000	0.3485	0.0000	0.0714	0.0000
	ROTOR	0.0000	-0.4246	0.0000	0.3252	0.0000	-0.0235	0.0000
	AIRFRM	0.0000	-0.7824	0.0000	0.0233	0.0000	0.0949	0.0000
U	TOTAL	-0.0471	0.0000	-0.1971	0.0000	-0.0004	0.0000	0.0027
	ROTOR	-0.0103	0.0000	-0.1319	0.0000	0.0018	0.0000	0.0027
	AIRFRM	-0.0368	0.0000	-0.0652	0.0000	-0.0021	0.0000	0.0000
V	TOTAL	0.0000	-0.0094	0.0000	-0.0008	0.0000	-0.0017	0.0000
	ROTOR	0.0000	-0.0070	0.0000	0.0001	0.0000	0.0020	0.0000
	AIRFRM	0.0000	-0.0025	0.0000	-0.0009	0.0000	-0.0038	0.0000
W	TOTAL	0.0075	0.0000	-0.4368	0.0000	0.0085	0.0000	-0.0119
	ROTOR	0.0077	0.0000	-0.2791	0.0000	-0.0005	0.0000	-0.0119
	AIRFRM	-0.0002	0.0000	-0.1577	0.0000	0.0090	0.0000	0.0000
RPM	TOTAL	0.0103	0.0000	-0.8687	0.0000	-0.0076	0.0000	0.6134
	ROTOR	0.0109	0.0000	-0.8472	0.0000	-0.0005	0.0000	0.6134
	AIRFRM	-0.0006	0.0000	-0.0215	0.0000	-0.0071	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	-0.0700	0.0000	-5.1685	0.0000	-0.0264	0.0000	-0.4806
	ROTOR	-0.0668	0.0000	-5.0749	0.0000	0.0180	0.0000	-0.4806
	AIRFRM	-0.0033	0.0000	-0.0936	0.0000	-0.0444	0.0000	0.0000
XTHEG	TOTAL	-0.0897	0.0000	-3.2900	0.0000	-0.0133	0.0000	2.1507
	ROTOR	-0.0876	0.0000	-3.2315	0.0000	0.0149	0.0000	2.1507
	AIRFRM	-0.0020	0.0000	-0.0585	0.0000	-0.0282	0.0000	0.0000
XLN	TOTAL	1.0946	0.0000	0.5540	0.0000	-0.2586	0.0000	-0.5188
	ROTOR	1.0927	0.0000	0.7696	0.0000	-0.1716	0.0000	-0.5188
	AIRFRM	0.0019	0.0000	-0.2156	0.0000	-0.0870	0.0000	0.0000
XLT	TOTAL	0.0000	-0.2083	0.0000	0.2528	0.0000	-0.0213	0.0000
	ROTOR	0.0000	-0.2083	0.0000	0.2327	0.0000	-0.0196	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0201	0.0000	-0.0018	0.0000
XPD	TOTAL	0.0000	-0.0314	0.0000	-0.0564	0.0000	0.1060	0.0000
	ROTOR	0.0000	0.1894	0.0000	-0.0509	0.0000	0.0758	0.0000
	AIRFRM	0.0000	-0.2208	0.0000	-0.0055	0.0000	0.0301	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT = 60.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

EARTH REFERENCE

		UE	VE	WE
RATE	(FPS)	101.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.1627E-04	-.1511E-06	0.1493E-02

BODY REFERENCE

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	100.8	0.0000E+00	-10.04	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1624E-04	-.3587E-01	-.3734E-06

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	60.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	12.19
ANGLE OF ATTACK	(DEG)	-5.689
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-5.689
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5280E+05
IXZ	1234.
IYY	0.2136E+05
IZZ	0.6634E+05

CENTER OF GRAVITY (IN)

S.L.	301.2
B.L.	0.0000E+00
W.L.	81.65

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	4.6789	46.79
LONG	(FWD)	5.2942	55.15
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE / BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	572.8	5108.	3.270	872.3	0.7813
RIGHT	572.8	5108.	3.270	872.3	0.7813
ENGINE	626.0				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	42.9564	42.9564
B1	1.0377	1.0377
A1	0.0000	0.0000

ROTOR — FLAPPING / FORCES - MAST AXIS / JET

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.6543	0.1763	4.9623	5935.89	82.61	200.27	37.10
RIGHT	2.6543	0.1763	4.9623	5935.89	82.61	200.27	37.10

SURFACE POSITIONS (DEG)

ELEVATOR	2.3398
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	-0.0265	0.1307	24.0342	0.0441	0.000589	0.008559	0.018837
RIGHT	-0.0265	0.1307	24.0342	0.0441	0.000589	0.008559	0.018837

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01252	0.01172	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01252	0.01172				

TIME USED FOR THIS TRIM = 0.0180 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT = 60.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-42.616	0.000	-21.253	0.000	-2107.491	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-743.880	0.000	-1035.987	0.001	478.278	0.000
TOTAL	-743.880	0.000	-1035.987	0.001	478.278	0.000
ENGINE PYLONS	-180.801	0.000	87.006	0.000	267.775	0.000
HORIZ. STAB.	-9.946	0.000	-78.060	0.000	-1665.795	0.000
VERT. STAB.						
FIN NO. 1	-0.798	0.000	0.000	0.000	2.262	-5.117
FIN NO. 2	-0.798	0.000	0.000	0.000	2.262	5.117
TOTAL	-1.595	0.000	0.000	0.000	4.525	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	0.000	0.000	-37.098	596.663	3.710	0.000
RIGHT ENG	0.000	0.000	-37.098	-596.663	3.710	0.000
TOTAL	0.000	0.000	-74.196	0.000	7.420	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-978.839	0.000	-1122.491	0.001	-3015.290	0.000
ROTOR						
LEFT ROTOR	-82.595	-303.834	-5931.493	92882.391	1055.398	-6473.122
RIGHT ROTOR	-82.594	303.834	-5931.493	-92882.391	1055.397	6473.121
HUB SPINNER	-144.608	0.000	48.895	0.000	891.124	0.000
TOTAL ROTOR	-309.797	0.000	-11814.091	0.000	3001.919	0.000
TOTAL AIRCRAFT (BODY AXIS)	-1288.636	0.000	-12936.581	0.001	-13.371	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.053	0.000	-0.603	0.001	-13.371	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52795.0, IYY = 21360.0, IZZ = 66335.0, DRIVEI = 824.0 SLUG-FT2

*** VT = 60.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.9019	0.0000	-1.0976	0.0000	0.1470	0.0000
	ROTOR	0.0000	-0.8272	0.0000	-0.8528	0.0000	0.1213	0.0000
	AIRFRM	0.0000	-0.0747	0.0000	-0.2449	0.0000	0.0256	0.0000
Q	TOTAL	1.4483	0.0000	-1.6387	0.0000	-1.1048	0.0000	0.3447
	ROTOR	1.4582	0.0000	0.4436	0.0000	-0.2559	0.0000	0.3447
	AIRFRM	-0.0099	0.0000	-2.0823	0.0000	-0.8489	0.0000	0.0000
R	TOTAL	0.0000	0.3041	0.0000	0.3492	0.0000	-0.1044	0.0000
	ROTOR	0.0000	-0.0725	0.0000	0.2801	0.0000	-0.0334	0.0000
	AIRFRM	0.0000	0.3765	0.0000	0.0690	0.0000	-0.0710	0.0000
U	TOTAL	-0.0761	0.0000	-0.1771	0.0000	0.0041	0.0000	-0.0044
	ROTOR	-0.0188	0.0000	-0.1024	0.0000	0.0030	0.0000	-0.0044
	AIRFRM	-0.0573	0.0000	-0.0748	0.0000	0.0011	0.0000	0.0000
V	TOTAL	0.0000	-0.0606	0.0000	-0.0028	0.0000	0.0017	0.0000
	ROTOR	0.0000	-0.0102	0.0000	-0.0001	0.0000	0.0011	0.0000
	AIRFRM	0.0000	-0.0504	0.0000	-0.0027	0.0000	0.0006	0.0000
W	TOTAL	-0.0215	0.0000	-0.6570	0.0000	-0.0052	0.0000	-0.0216
	ROTOR	0.0049	0.0000	-0.3382	0.0000	0.0001	0.0000	-0.0216
	AIRFRM	-0.0264	0.0000	-0.3188	0.0000	-0.0053	0.0000	0.0000
RPM	TOTAL	0.0199	0.0000	-0.8872	0.0000	-0.0202	0.0000	0.5422
	ROTOR	0.0212	0.0000	-0.8400	0.0000	-0.0024	0.0000	0.5422
	AIRFRM	-0.0012	0.0000	-0.0472	0.0000	-0.0179	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	-0.1779	0.0000	-5.6907	0.0000	-0.0779	0.0000	-0.5989
	ROTOR	-0.1821	0.0000	-5.4944	0.0000	0.0356	0.0000	-0.5989
	AIRFRM	0.0042	0.0000	-0.1962	0.0000	-0.1136	0.0000	0.0000
XTHEG	TOTAL	-0.1228	0.0000	-3.6641	0.0000	-0.0530	0.0000	2.0280
	ROTOR	-0.1256	0.0000	-3.5382	0.0000	0.0201	0.0000	2.0280
	AIRFRM	0.0029	0.0000	-0.1260	0.0000	-0.0730	0.0000	0.0000
XLN	TOTAL	1.0511	0.0000	0.8334	0.0000	-0.3257	0.0000	-0.4454
	ROTOR	1.0623	0.0000	1.2414	0.0000	-0.1691	0.0000	-0.4454
	AIRFRM	-0.0112	0.0000	-0.4081	0.0000	-0.1566	0.0000	0.0000
XLT	TOTAL	0.0000	-0.2126	0.0000	0.2814	0.0000	-0.0252	0.0000
	ROTOR	0.0000	-0.2126	0.0000	0.2524	0.0000	-0.0226	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0290	0.0000	-0.0026	0.0000
XPD	TOTAL	0.0000	-0.3725	0.0000	-0.0350	0.0000	0.0798	0.0000
	ROTOR	0.0000	0.0583	0.0000	-0.0255	0.0000	0.0211	0.0000
	AIRFRM	0.0000	-0.4308	0.0000	-0.0095	0.0000	0.0588	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	135.0	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.2014E-04	0.7828E-07	0.3618E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	133.2	-.1430E-06	-21.93	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.2832E-05	-.4885E-03	0.2148E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		80.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		21.67
ANGLE OF ATTACK (DEG)		-9.346
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-9.346
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5280E+05	S.L.	301.2
IXZ	1234.	B.L.	0.0000E+00
IYY	0.2136E+05	W.L.	81.65
IZZ	0.6634E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	5.1722	51.72
LONG	(FWD)	5.7948	60.36
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	660.4	5889.	3.516	906.0	0.8115
RIGHT	660.4	5889.	3.516	906.0	0.8115
ENGINE	720.1				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	43.9911	43.9911
B1	2.0891	2.0891
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	4.7105
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.7312	0.3344	4.0996	6180.81	137.57	135.22	33.98
RIGHT	2.7312	0.3344	4.0996	6180.81	137.57	135.22	33.98

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	-0.0511	0.1728	18.6232	0.0525	0.000679	0.008912	0.019671
RIGHT	-0.0511	0.1728	18.6232	0.0525	0.000679	0.008912	0.019671

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00641	0.01098	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00641	0.01098				

TIME USED FOR THIS TRIM = 0.0213 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-104.003	0.000	44.085	0.000	-5308.990	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1154.732	0.000	-676.317	0.003	-322.313	0.000
TOTAL	-1154.732	0.000	-676.317	0.003	-322.313	0.000
ENGINE PYLONS	-305.502	0.000	118.605	0.000	455.304	0.000
HORIZ. STAB.	-10.673	0.000	31.094	0.000	689.586	0.000
VERT. STAB.						
FIN NO. 1	-2.331	0.000	0.000	0.000	6.612	-14.956
FIN NO. 2	-2.331	0.000	0.000	0.000	6.612	14.958
TOTAL	-4.662	0.000	0.000	0.000	13.225	0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	0.000	0.000	-33.981	546.525	3.398	0.000
RIGHT ENG	0.000	0.000	-33.981	-546.525	3.398	0.000
TOTAL	0.000	0.000	-67.962	0.000	6.796	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1579.572	0.000	-550.495	0.003	-4466.393	0.001
ROTOR						
LEFT ROTOR	-137.552	-243.065	-6177.508	97429.766	1442.405	-8137.278
RIGHT ROTOR	-137.552	243.065	-6177.508	-97429.766	1442.405	8137.279
HUB SPINNER	-256.482	0.000	78.063	0.000	1581.401	0.000
TOTAL ROTOR	-531.587	0.000	-12276.952	0.000	4466.211	0.001
TOTAL AIRCRAFT (BODY AXIS)	-2111.158	0.000	-12827.447	0.003	-0.182	0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.010	0.000	-0.013	0.003	-0.182	0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52795.0, IYY = 21360.0, IZZ = 66335.0, DRIVEI = 824.0 SLUG-FT2

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.1247	0.0000	-1.2896	0.0000	0.1944	0.0000
	ROTOR	0.0000	-0.9593	0.0000	-0.9657	0.0000	0.1333	0.0000
	AIRFRM	0.0000	-0.1654	0.0000	-0.3239	0.0000	0.0611	0.0000
Q	TOTAL	1.3930	0.0000	-2.0505	0.0000	-1.1357	0.0000	0.9615
	ROTOR	1.4617	0.0000	0.0583	0.0000	-0.2572	0.0000	0.9615
	AIRFRM	-0.0687	0.0000	-2.1088	0.0000	-0.8785	0.0000	0.0000
R	TOTAL	0.0000	0.7641	0.0000	0.3208	0.0000	-0.1774	0.0000
	ROTOR	0.0000	-0.0697	0.0000	0.2260	0.0000	-0.0345	0.0000
	AIRFRM	0.0000	0.8338	0.0000	0.0948	0.0000	-0.1430	0.0000
U	TOTAL	-0.0944	0.0000	-0.1242	0.0000	0.0103	0.0000	-0.0104
	ROTOR	-0.0193	0.0000	-0.0534	0.0000	0.0030	0.0000	-0.0104
	AIRFRM	-0.0751	0.0000	-0.0708	0.0000	0.0073	0.0000	0.0000
V	TOTAL	0.0000	-0.0941	0.0000	-0.0049	0.0000	0.0031	0.0000
	ROTOR	0.0000	-0.0148	0.0000	-0.0005	0.0000	0.0007	0.0000
	AIRFRM	0.0000	-0.0793	0.0000	-0.0044	0.0000	0.0024	0.0000
W	TOTAL	-0.0396	0.0000	-0.8028	0.0000	-0.0115	0.0000	-0.0085
	ROTOR	0.0023	0.0000	-0.3673	0.0000	0.0006	0.0000	-0.0085
	AIRFRM	-0.0420	0.0000	-0.4355	0.0000	-0.0121	0.0000	0.0000
RPM	TOTAL	0.0234	0.0000	-1.0537	0.0000	-0.0290	0.0000	0.6594
	ROTOR	0.0231	0.0000	-1.0069	0.0000	-0.0025	0.0000	0.6594
	AIRFRM	0.0004	0.0000	-0.0467	0.0000	-0.0264	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	-0.3130	0.0000	-6.1758	0.0000	-0.0982	0.0000	-0.4931
	ROTOR	-0.3131	0.0000	-5.9157	0.0000	0.0557	0.0000	-0.4931
	AIRFRM	0.0000	0.0000	-0.2601	0.0000	-0.1539	0.0000	0.0000
XTHEG	TOTAL	-0.1515	0.0000	-4.0011	0.0000	-0.0760	0.0000	2.3054
	ROTOR	-0.1532	0.0000	-3.8317	0.0000	0.0237	0.0000	2.3054
	AIRFRM	0.0017	0.0000	-0.1694	0.0000	-0.0996	0.0000	0.0000
XLN	TOTAL	1.1050	0.0000	1.1850	0.0000	-0.3804	0.0000	-0.4237
	ROTOR	1.1297	0.0000	1.7253	0.0000	-0.1787	0.0000	-0.4237
	AIRFRM	-0.0247	0.0000	-0.5403	0.0000	-0.2017	0.0000	0.0000
XLT	TOTAL	0.0000	-0.2002	0.0000	0.3144	0.0000	-0.0321	0.0000
	ROTOR	0.0000	-0.2002	0.0000	0.2736	0.0000	-0.0290	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0407	0.0000	-0.0031	0.0000
XPD	TOTAL	0.0000	-0.5176	0.0000	-0.0493	0.0000	0.1020	0.0000
	ROTOR	0.0000	0.0666	0.0000	-0.0364	0.0000	0.0223	0.0000
	AIRFRM	0.0000	-0.5842	0.0000	-0.0128	0.0000	0.0797	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =100.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	168.8	-.5684E-13	-.3815E-05
ACCEL	(FPS2)	0.2769E-03	0.5277E-06	-.1741E-02

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	164.7	-.8925E-06	-36.86	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1044E-05	0.2971E-01	0.6789E-06

ATMOSPHERIC CONDITIONS

ALTITUDE	(FT)	5000.00
DENSITY ALT.	(FT)	0.00
PRESSURE ALT.	(FT)	0.00
AMBIENT TEMP	(DEG-R)	288.16
OUTSIDE AIR TEMP	(DEG-C)	15.00
AIR DENSITY	(SLUGS/FT3)	0.2377E-02
THETES	(ND)	1.00000
DELSTD	(ND)	1.00000
SIGMA PRIME	(ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	100.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	33.86
ANGLE OF ATTACK	(DEG)	-12.614
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-12.614
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5280E+05
IXZ	1234.
IYY	0.2136E+05
IZZ	0.6634E+05

CENTER OF GRAVITY (IN)

S.L.	301.2
B.L.	0.0000E+00
W.L.	81.65

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	6.5366	65.37
LONG	(FWD)	6.9384	72.28
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE

	POWER (SHP)	TORQUE (FT-LBS)
LEFT	910.0	8114.
RIGHT	910.0	8114.
ENGINE	988.4	

BLADE

	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	4.022	939.8	0.8418
RIGHT	4.022	939.8	0.8418

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	46.6802	46.6802
B1	4.4907	4.4907
A1	0.0000	0.0000

ROTOR — FLAPPING

	A0 (DEG)	LONG (DEG)	LAT (DEG)
LEFT	2.9574	-0.2382	3.7819
RIGHT	2.9574	-0.2382	3.7819

ROTOR — FORCES - MAST AXIS

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	6900.68	123.96	91.77	40.33
RIGHT	6900.68	123.96	91.77	40.33

SURFACE POSITIONS (DEG)

ELEVATOR	10.1255
AILERON	0.0000
RUDDER	0.0000

ROTOR

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	-0.0418	0.2136	16.6955	0.0694	0.000936	0.009950	0.022631
RIGHT	-0.0418	0.2136	16.6955	0.0694	0.000936	0.009950	0.022631

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00017	0.01027	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00017	0.01027				

TIME USED FOR THIS TRIM = 0.0173 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT =100.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-229.311	0.000	196.522	0.000	-10466.281	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1523.955	0.000	368.162	0.007	-2026.303	0.000
TOTAL	-1523.955	0.000	368.162	0.007	-2026.303	0.000
ENGINE PYLONS	-466.540	0.000	180.068	0.000	695.411	0.000
HORIZ. STAB.	26.079	0.000	320.059	0.000	6856.203	0.000
VERT. STAB.						
FIN NO. 1	-4.256	0.000	0.000	0.000	12.073	-27.309
FIN NO. 2	-4.256	0.000	0.000	0.000	12.073	27.311
TOTAL	-8.512	0.000	0.000	0.000	24.146	0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	0.000	0.000	-40.329	648.633	4.033	0.000
RIGHT ENG	0.000	0.000	-40.329	-648.633	4.033	0.000
TOTAL	0.000	0.000	-80.659	0.000	8.066	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2202.240	0.000	984.152	0.007	-4908.757	0.001
ROTOR						
LEFT ROTOR	-123.945	-212.190	-6898.026	109339.563	1262.503	-10136.999
RIGHT ROTOR	-123.945	212.190	-6898.026	-109339.563	1262.503	10136.999
HUB SPINNER	-388.541	0.000	126.332	0.000	2394.830	0.000
TOTAL ROTOR	-636.431	0.000	-13669.721	0.000	4919.836	0.000
TOTAL AIRCRAFT (BODY AXIS)	-2838.671	0.000	-12685.568	0.007	11.079	0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.263	0.000	0.663	0.007	11.079	0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52795.0, IYY = 21360.0, IZZ = 66335.0, DRIVEI = 824.0 SLUG-FT2

*** VT =100.00 KTS *** NACELLE INCIDENCE = 90.0 DEG *** HELICOPTER ***
*** GW = 13000.0 RPM = 589.00 SLCG = 301.20 WLCG = 81.65 ***
*** MAST ANGLE = 0.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.5800	0.0000	-1.3313	0.0000	0.2386	0.0000
	ROTOR	0.0000	-1.3370	0.0000	-1.0431	0.0000	0.1589	0.0000
	AIRFRM	0.0000	-0.2429	0.0000	-0.2882	0.0000	0.0797	0.0000
Q	TOTAL	1.3460	0.0000	-2.3683	0.0000	-1.1507	0.0000	1.1970
	ROTOR	1.7167	0.0000	-0.2653	0.0000	-0.2909	0.0000	1.1970
	AIRFRM	-0.3707	0.0000	-2.1030	0.0000	-0.8597	0.0000	0.0000
R	TOTAL	0.0000	1.1355	0.0000	0.2845	0.0000	-0.2447	0.0000
	ROTOR	0.0000	-0.0850	0.0000	0.1909	0.0000	-0.0420	0.0000
	AIRFRM	0.0000	1.2205	0.0000	0.0936	0.0000	-0.2027	0.0000
U	TOTAL	-0.1065	0.0000	-0.0452	0.0000	0.0163	0.0000	-0.0107
	ROTOR	-0.0268	0.0000	-0.0185	0.0000	0.0039	0.0000	-0.0107
	AIRFRM	-0.0797	0.0000	-0.0267	0.0000	0.0124	0.0000	0.0000
V	TOTAL	0.0000	-0.1308	0.0000	-0.0076	0.0000	0.0047	0.0000
	ROTOR	0.0000	-0.0238	0.0000	-0.0015	0.0000	0.0007	0.0000
	AIRFRM	0.0000	-0.1071	0.0000	-0.0061	0.0000	0.0040	0.0000
W	TOTAL	-0.0369	0.0000	-0.8063	0.0000	-0.0165	0.0000	0.0191
	ROTOR	0.0033	0.0000	-0.3731	0.0000	0.0006	0.0000	0.0191
	AIRFRM	-0.0402	0.0000	-0.4332	0.0000	-0.0171	0.0000	0.0000
RPM	TOTAL	0.0316	0.0000	-1.3197	0.0000	-0.0264	0.0000	1.2685
	ROTOR	0.0385	0.0000	-1.2764	0.0000	-0.0046	0.0000	1.2685
	AIRFRM	-0.0069	0.0000	-0.0433	0.0000	-0.0218	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	-0.4489	0.0000	-6.3347	0.0000	-0.0337	0.0000	0.0420
	ROTOR	-0.4156	0.0000	-6.1550	0.0000	0.0717	0.0000	0.0420
	AIRFRM	-0.0333	0.0000	-0.1798	0.0000	-0.1054	0.0000	0.0000
XTHEG	TOTAL	-0.1746	0.0000	-4.1349	0.0000	-0.0451	0.0000	2.8712
	ROTOR	-0.1529	0.0000	-4.0166	0.0000	0.0236	0.0000	2.8712
	AIRFRM	-0.0216	0.0000	-0.1184	0.0000	-0.0687	0.0000	0.0000
XLN	TOTAL	1.2795	0.0000	1.3929	0.0000	-0.4768	0.0000	-0.4612
	ROTOR	1.3613	0.0000	2.1016	0.0000	-0.2078	0.0000	-0.4612
	AIRFRM	-0.0819	0.0000	-0.7088	0.0000	-0.2690	0.0000	0.0000
XLT	TOTAL	0.0000	-0.2069	0.0000	0.3349	0.0000	-0.0395	0.0000
	ROTOR	0.0000	-0.2069	0.0000	0.2850	0.0000	-0.0369	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0498	0.0000	-0.0025	0.0000
XPD	TOTAL	0.0000	-0.6483	0.0000	-0.0605	0.0000	0.1266	0.0000
	ROTOR	0.0000	0.0837	0.0000	-0.0444	0.0000	0.0267	0.0000
	AIRFRM	0.0000	-0.7320	0.0000	-0.0160	0.0000	0.0999	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL

CONFIGURATION:

NACELLE INCIDENCE	90.0 DEG	GEAR	0.0 % DOWN			ALTITUDE	
FLAP SETTING	40/25 DEG	STAB INCIDENCE	0.000 DEG			PRES(MSL)	0.0 FT
ROTOR RPM	589.0 RPM	INERTIA, SLUG-FT2				DENSITY	0.0 FT
GROSS WEIGHT	13000.0 LB	IXX	52795.	IXZ	1234.0	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	301.200 IN	IYY	21360.	IZZ	66335.	TEMP(OAT)	15.00 DEG-C
W.L.	81.650 IN	SIGMAP	1.00000 -ND-			VSOUND	661.48 KTS
		RHO	0.0023769 SLG/FT3			WIND-V	0.00 KTS

U/VKCAS -KTS NOTE: SYMBOL INDICATES A TRIM PROBLEM

	0.00	20.00	40.00	60.00	80.00	100.00	0.00	0.00
	0.00	20.00	40.00	60.00	80.00	100.00	0.00	0.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	54.8980	56.0902	52.8030	55.1474	60.3628	72.2753	0.0000	0.0000
XLT,%	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000
XCOL,%	69.3195	66.2842	50.6733	46.7886	51.7218	65.3661	0.0000	0.0000
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	0.9874	1.2278	0.5651	1.0377	2.0891	4.4907	0.0000	0.0000
THETO,DEG	47.0917	46.3773	43.6703	42.9564	43.9911	46.6802	0.0000	0.0000
THOG,DEG	3.8006	3.5719	3.3626	3.2703	3.5156	4.0217	0.0000	0.0000
ELEVATOR,DEG	2.2264	2.7683	1.2741	2.3398	4.7105	10.1255	0.0000	0.0000
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	-0.9617	-1.0237	-0.1520	0.1763	0.3344	-0.2382	0.0000	0.0000
LTFLP,DEG	-0.2085	3.9601	5.7423	4.9623	4.0996	3.7819	0.0000	0.0000
THRUST,LB	7333.9	7112.0	6097.2	5935.9	6180.8	6900.7	0.00000E+00	0.00000E+00
CT	0.0106	0.0103	0.0088	0.0086	0.0089	0.0099	0.0000	0.0000
H-FORCE,LB	-125.09	-109.86	24.562	82.607	137.57	123.96	0.00000E+00	0.00000E+00
Y-FORCE,LB	-29.163	196.00	260.70	200.27	135.22	91.771	0.00000E+00	0.00000E+00
HORSEPOWER	990.72	928.72	642.01	572.80	660.43	909.99	0.00000E+00	0.00000E+00
Q,FT-LB	8834.3	8281.4	5724.8	5107.7	5889.1	8114.4	0.00000E+00	0.00000E+00
CP	0.0010	0.0010	0.0007	0.0006	0.0007	0.0009	0.0000	0.0000
RPM,ROTOR	589.00	589.00	589.00	589.00	589.00	589.00	0.00000E+00	0.00000E+00
WI,FT/SEC	52.6213	51.9495	35.4892	24.0342	18.6232	16.6955	0.0000	0.0000
MU	0.0000	0.0438	0.0875	0.1307	0.1728	0.2136	0.0000	0.0000
LAMDA	0.0682	0.0670	0.0498	0.0441	0.0525	0.0694	0.0000	0.0000
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	1.1100	0.4112	-2.5191	-5.6886	-9.3460	-12.6139	0.0000	0.0000
PITCH,DEG	1.1100	0.4112	-2.5191	-5.6886	-9.3460	-12.6139	0.0000	0.0000
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	0.0000	1.3542	5.4168	12.1878	21.6672	33.8550	0.0000	0.0000
MACH NUMBER	0.0000	0.0302	0.0605	0.0907	0.1209	0.1512	0.0000	0.0000
VT,KNOTS	0.0059	20.0000	40.0000	60.0000	80.0000	100.0000	0.0000	0.0000
VKCAS,KNOTS	0.0000	19.9999	39.9997	60.0003	80.0000	100.0002	0.0000	0.0000
HP-ENG	1075.2	1008.7	700.37	625.96	720.11	988.44	0.00000E+00	0.00000E+00

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0017 MIN TOTAL TIME USED IN THIS RUN = 0.3978 MIN

TIME: 22:09:41
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:09:41

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	15.0 degrees
Nacelle Incidence	=	75.0 degrees
Rotor Speed	=	589.0 RPM
Flap/Flaperon Position	=	40/25 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	40, 60, 80, 100, 120 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT = 40.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	67.51	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.4335E-04	-.5777E-07	-.2269E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	66.76	0.9369E-08	10.06	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.1390E-05	0.6338E-02	0.2485E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		40.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		5.42
ANGLE OF ATTACK (DEG)		8.569
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		8.569
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5249E+05	S.L.	299.9
IXZ	1208.	B.L.	0.0000E+00
IYY	0.2119E+05	W.L.	80.80
IZZ	0.6647E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	4.9465	49.46
LONG	(FWD)	3.4066	35.49
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	621.2	5540.	1.287	836.4	0.7492
RIGHT	621.2	5540.	1.287	836.4	0.7492
ENGINE	678.0				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	42.8358	42.8358
B1	-2.7844	-2.7844
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	-6.5975
AILERON	0.0000
RUDDER	0.0000

ROTOR — FLAPPING

	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.5823	2.9899	6.0129	5706.89	329.24	272.36	49.76
RIGHT	2.5823	2.9900	6.0129	5706.89	329.24	272.36	49.76

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.2287	0.0870	33.0144	0.0525	0.000639	0.008228	0.017808
RIGHT	0.2287	0.0870	33.0144	0.0525	0.000639	0.008228	0.017808

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01903	0.01258	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01903	0.01258				

TIME USED FOR THIS TRIM = 0.0112 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 40.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-6.625	0.000	-83.086	0.000	541.679	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-225.878	0.000	-1462.837	0.001	881.303	0.000
TOTAL	-225.878	0.000	-1462.837	0.001	881.303	0.000
ENGINE PYLONS	-116.474	0.000	59.321	0.000	187.028	0.000
HORIZ. STAB.	5.880	0.000	-105.728	0.000	-2302.895	0.000
VERT. STAB.						
FIN NO. 1	0.768	0.000	0.000	0.000	-2.232	4.927
FIN NO. 2	0.768	0.000	0.000	0.000	-2.232	-4.926
TOTAL	1.536	0.000	0.000	0.000	-4.464	0.001
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	12.880	0.000	-48.069	773.114	-21.172	207.155
RIGHT ENG	12.880	0.000	-48.069	-773.114	-21.172	-207.155
TOTAL	25.760	0.000	-96.139	0.000	-42.345	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-315.802	0.000	-1688.468	0.001	-739.694	0.001
ROTOR						
LEFT ROTOR	1157.625	-370.015	-5592.200	88263.930	191.313	12558.465
RIGHT ROTOR	1157.625	370.015	-5592.200	-88263.930	191.315	-12558.460
HUB SPINNER	-62.388	0.000	18.086	0.000	359.413	0.000
TOTAL ROTOR	2252.862	0.000	-11166.313	0.000	742.040	0.005
TOTAL AIRCRAFT (BODY AXIS)	1937.060	0.000	-12854.782	0.001	2.346	0.006
TOTAL AIRCRAFT (INERTIAL AXIS)	0.003	0.000	0.093	0.001	2.346	0.006

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52487.5, IYY = 21191.4, IZZ = 66473.9, DRIVEI = 824.0 SLUG-FT2

****
*** VT = 40.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.1684	0.0000	-0.8945	0.0000	-0.0470	0.0000
	ROTOR	0.0000	-0.2799	0.0000	-0.7794	0.0000	-0.0105	0.0000
	AIRFRM	0.0000	0.1115	0.0000	-0.1152	0.0000	-0.0364	0.0000
Q	TOTAL	1.0542	0.0000	-0.6672	0.0000	-0.8544	0.0000	1.8978
	ROTOR	0.8271	0.0000	0.9249	0.0000	-0.1979	0.0000	1.8978
	AIRFRM	0.2271	0.0000	-1.5921	0.0000	-0.6565	0.0000	0.0000
R	TOTAL	0.0000	-1.0273	0.0000	0.1874	0.0000	0.1030	0.0000
	ROTOR	0.0000	-0.4791	0.0000	0.1523	0.0000	0.0361	0.0000
	AIRFRM	0.0000	-0.5482	0.0000	0.0351	0.0000	0.0668	0.0000
U	TOTAL	-0.0283	0.0000	-0.1559	0.0000	0.0043	0.0000	0.0145
	ROTOR	0.0055	0.0000	-0.0673	0.0000	0.0012	0.0000	0.0145
	AIRFRM	-0.0338	0.0000	-0.0886	0.0000	0.0031	0.0000	0.0000
V	TOTAL	0.0000	-0.0133	0.0000	0.0000	0.0000	-0.0009	0.0000
	ROTOR	0.0000	-0.0056	0.0000	0.0003	0.0000	0.0016	0.0000
	AIRFRM	0.0000	-0.0078	0.0000	-0.0003	0.0000	-0.0025	0.0000
W	TOTAL	0.1052	0.0000	-0.5004	0.0000	-0.0164	0.0000	0.0041
	ROTOR	0.0701	0.0000	-0.3065	0.0000	-0.0013	0.0000	0.0041
	AIRFRM	0.0351	0.0000	-0.1939	0.0000	-0.0151	0.0000	0.0000
RPM	TOTAL	0.1797	0.0000	-0.8186	0.0000	-0.0097	0.0000	0.5945
	ROTOR	0.1776	0.0000	-0.7992	0.0000	-0.0033	0.0000	0.5945
	AIRFRM	0.0021	0.0000	-0.0194	0.0000	-0.0064	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.9062	0.0000	-4.6540	0.0000	-0.0386	0.0000	-0.9027
	ROTOR	0.9040	0.0000	-4.5754	0.0000	-0.0004	0.0000	-0.9027
	AIRFRM	0.0022	0.0000	-0.0787	0.0000	-0.0382	0.0000	0.0000
XTHEG	TOTAL	0.5988	0.0000	-3.3417	0.0000	-0.0234	0.0000	2.3018
	ROTOR	0.5966	0.0000	-3.2833	0.0000	0.0039	0.0000	2.3018
	AIRFRM	0.0022	0.0000	-0.0584	0.0000	-0.0273	0.0000	0.0000
XLN	TOTAL	0.6738	0.0000	0.8155	0.0000	-0.2294	0.0000	-0.6073
	ROTOR	0.6538	0.0000	1.0305	0.0000	-0.1405	0.0000	-0.6073
	AIRFRM	0.0201	0.0000	-0.2149	0.0000	-0.0889	0.0000	0.0000
XLT	TOTAL	0.0000	-0.2077	0.0000	0.2491	0.0000	0.0214	0.0000
	ROTOR	0.0000	-0.2077	0.0000	0.2287	0.0000	0.0197	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0203	0.0000	0.0017	0.0000
XPD	TOTAL	0.0000	-0.0575	0.0000	-0.0824	0.0000	0.0800	0.0000
	ROTOR	0.0000	0.1645	0.0000	-0.0766	0.0000	0.0498	0.0000
	AIRFRM	0.0000	-0.2219	0.0000	-0.0058	0.0000	0.0302	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT = 60.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	101.3	0.0000E+00	-.9537E-06
ACCEL	(FPS2)	0.4322E-04	0.2496E-06	-.1529E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	100.8	0.1009E-06	9.852	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.2274E-05	0.1217E-02	-.1830E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		60.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		12.19
ANGLE OF ATTACK (DEG)		5.583
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		5.583
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5249E+05	S.L.	299.9
IXZ	1208.	B.L.	0.0000E+00
IYY	0.2119E+05	W.L.	80.80
IZZ	0.6647E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	4.2753	42.75
LONG	(FWD)	4.5420	47.31
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	506.5	4516.	1.212	869.2	0.7786
RIGHT	506.5	4516.	1.212	869.2	0.7786
ENGINE	554.6				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	41.8044	41.8044
B1	-0.4739	-0.4739
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	-1.2215
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.3643	1.3843	4.4837	5012.95	189.03	141.81	32.36
RIGHT	2.3643	1.3843	4.4837	5012.95	189.03	141.81	32.36

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.4050	0.1296	20.3212	0.0478	0.000521	0.007228	0.016194
RIGHT	0.4050	0.1296	20.3212	0.0478	0.000521	0.007228	0.016194

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01330	0.01174	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01330	0.01174				

TIME USED FOR THIS TRIM = 0.0180 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 60.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-21.801	0.000	-152.539	0.000	575.280	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-609.338	0.000	-2901.064	-0.002	1827.117	0.000
TOTAL	-609.338	0.000	-2901.064	-0.002	1827.117	0.000
ENGINE PYLONS	-195.021	0.000	38.493	0.000	312.436	0.000
HORIZ. STAB.	-4.221	0.000	-98.498	0.000	-2127.469	0.000
VERT. STAB.						
FIN NO. 1	-0.523	0.000	0.000	0.000	1.521	-3.358
FIN NO. 2	-0.523	0.000	0.000	0.000	1.521	3.358
TOTAL	-1.047	0.000	0.000	0.000	3.043	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	8.376	0.000	-31.258	502.733	-13.768	134.707
RIGHT ENG	8.376	0.000	-31.258	-502.733	-13.768	-134.707
TOTAL	16.751	0.000	-62.516	0.000	-27.535	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-814.677	0.000	-3176.124	-0.002	562.871	0.000
ROTOR						
LEFT ROTOR	1114.045	-227.150	-4887.930	77819.484	-727.193	13108.646
RIGHT ROTOR	1114.045	227.150	-4887.930	-77819.484	-727.194	-13108.647
HUB SPINNER	-148.725	0.000	13.712	0.000	891.969	0.000
TOTAL ROTOR	2079.365	0.000	-9762.147	0.000	-562.418	-0.002
TOTAL AIRCRAFT (BODY AXIS)	1264.687	0.000	-12938.271	-0.002	0.453	-0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	0.011	0.000	0.066	-0.002	0.453	-0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52487.5, IYY = 21191.4, IZZ = 66473.9, DRIVEI = 824.0 SLUG-FT2

****
*** VT = 60.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.3698	0.0000	-1.0755	0.0000	-0.0849	0.0000
	ROTOR	0.0000	-0.3193	0.0000	-0.9042	0.0000	-0.0685	0.0000
	AIRFRM	0.0000	-0.0505	0.0000	-0.1713	0.0000	-0.0165	0.0000
Q	TOTAL	0.8958	0.0000	-1.1463	0.0000	-0.8632	0.0000	0.9582
	ROTOR	0.8038	0.0000	0.4936	0.0000	-0.1852	0.0000	0.9582
	AIRFRM	0.0920	0.0000	-1.6400	0.0000	-0.6780	0.0000	0.0000
R	TOTAL	0.0000	0.1011	0.0000	0.1109	0.0000	-0.0383	0.0000
	ROTOR	0.0000	-0.1490	0.0000	0.0375	0.0000	0.0091	0.0000
	AIRFRM	0.0000	0.2501	0.0000	0.0734	0.0000	-0.0475	0.0000
U	TOTAL	-0.0627	0.0000	-0.1339	0.0000	0.0070	0.0000	0.0016
	ROTOR	-0.0117	0.0000	-0.0114	0.0000	0.0021	0.0000	0.0016
	AIRFRM	-0.0511	0.0000	-0.1225	0.0000	0.0049	0.0000	0.0000
V	TOTAL	0.0000	-0.0511	0.0000	-0.0010	0.0000	0.0010	0.0000
	ROTOR	0.0000	-0.0079	0.0000	0.0002	0.0000	0.0007	0.0000
	AIRFRM	0.0000	-0.0432	0.0000	-0.0012	0.0000	0.0003	0.0000
W	TOTAL	0.1276	0.0000	-0.5937	0.0000	-0.0022	0.0000	0.0019
	ROTOR	0.0890	0.0000	-0.3508	0.0000	-0.0023	0.0000	0.0019
	AIRFRM	0.0386	0.0000	-0.2429	0.0000	0.0001	0.0000	0.0000
RPM	TOTAL	0.1929	0.0000	-0.7574	0.0000	-0.0152	0.0000	0.4689
	ROTOR	0.1920	0.0000	-0.7353	0.0000	-0.0069	0.0000	0.4689
	AIRFRM	0.0009	0.0000	-0.0221	0.0000	-0.0083	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	1.0711	0.0000	-5.0148	0.0000	-0.0649	0.0000	-0.9151
	ROTOR	1.0798	0.0000	-4.9382	0.0000	-0.0098	0.0000	-0.9151
	AIRFRM	-0.0086	0.0000	-0.0767	0.0000	-0.0552	0.0000	0.0000
XTHEG	TOTAL	0.7429	0.0000	-3.6354	0.0000	-0.0467	0.0000	1.9845
	ROTOR	0.7488	0.0000	-3.5790	0.0000	-0.0069	0.0000	1.9845
	AIRFRM	-0.0059	0.0000	-0.0564	0.0000	-0.0398	0.0000	0.0000
XLN	TOTAL	0.4688	0.0000	1.0906	0.0000	-0.2584	0.0000	-0.5338
	ROTOR	0.4571	0.0000	1.4248	0.0000	-0.1267	0.0000	-0.5338
	AIRFRM	0.0117	0.0000	-0.3342	0.0000	-0.1316	0.0000	0.0000
XLT	TOTAL	0.0000	-0.1820	0.0000	0.2769	0.0000	0.0305	0.0000
	ROTOR	0.0000	-0.1820	0.0000	0.2477	0.0000	0.0288	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0292	0.0000	0.0017	0.0000
XPD	TOTAL	0.0000	-0.2911	0.0000	-0.0385	0.0000	0.0565	0.0000
	ROTOR	0.0000	0.0467	0.0000	-0.0307	0.0000	0.0103	0.0000
	AIRFRM	0.0000	-0.3377	0.0000	-0.0078	0.0000	0.0462	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****

*** VT = 80.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***

****

		EARTH REFERENCE		
		UE	VE	WE
RATE	(FPS)	135.0	-.1776E-14	0.0000E+00
ACCEL	(FPS2)	0.2425E-03	-.9969E-06	0.4644E-03

	BODY REFERENCE				
	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	135.0	0.2013E-07	1.544	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.1291E-03	-.8396E-03	0.1951E-04

ATMOSPHERIC CONDITIONS		FLIGHT PATH CONDITIONS		INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
ALTITUDE (FT)	5000.00	CAL. AIRSPEED (KNOTS)	80.01				
DENSITY ALT. (FT)	0.00	RATE OF DECENT (FPS)	0.00				
PRESSURE ALT.(FT)	0.00	G-LEVEL (G S)	1.00	IXX	0.5249E+05	S.L.	299.9
AMBIENT TEMP (DEG-R)	288.16	DYN PRES (SLUGS/FT-SEC2)	21.67	IXZ	1208.	B.L.	0.0000E+00
OUTSIDE AIR TEMP (DEG-C)	15.00	ANGLE OF ATTACK (DEG)	0.655	IYY	0.2119E+05	W.L.	80.80
AIR DENSITY (SLUGS/FT3)	0.2377E-02	FLIGHT PATH ANGLE (DEG)	0.000	IZZ	0.6647E+05		
		SIDESLIP ANGLE (DEG)	0.000				
THETES (ND)	1.00000	ROLL ANGLE (DEG)	0.000				
DELSTD (ND)	1.00000	PITCH ANGLE (DEG)	0.655				
SIGMA PRIME (ND)	1.00000	YAW ANGLE (DEG)	0.000				

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	4.4897	44.90
LONG	(FWD)	5.5399	57.71
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	540.4	4819.	1.717	902.1	0.8080
RIGHT	540.4	4819.	1.717	902.1	0.8080
ENGINE	591.1				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	42.6151	42.6151
B1	1.5568	1.5568
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	3.5035
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.2096	0.2945	3.0553	4520.48	147.18	29.77	25.92
RIGHT	2.2096	0.2945	3.0553	4520.47	147.18	29.77	25.92

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.4668	0.1697	13.6777	0.0611	0.000556	0.006518	0.015399
RIGHT	0.4668	0.1697	13.6776	0.0611	0.000556	0.006518	0.015399

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00750	0.01104	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00750	0.01104				

TIME USED FOR THIS TRIM = 0.0248 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-54.378	0.000	-170.132	0.000	-1059.477	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1271.903	0.000	-3966.061	0.008	2622.145	0.000
TOTAL	-1271.903	0.000	-3966.061	0.008	2622.145	0.000
ENGINE PYLONS	-320.588	0.000	44.654	0.000	513.381	0.000
HORIZ. STAB.	-12.682	0.000	-72.513	0.000	-1548.509	0.000
VERT. STAB.						
FIN NO. 1	-2.338	0.000	0.000	0.000	6.797	-15.001
FIN NO. 2	-2.338	0.000	0.000	0.000	6.797	15.003
TOTAL	-4.676	0.000	0.000	0.000	13.594	0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	6.708	0.000	-25.034	402.625	-11.026	107.883
RIGHT ENG	6.708	0.000	-25.034	-402.624	-11.026	-107.883
TOTAL	13.415	0.000	-50.067	0.001	-22.052	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1650.811	0.000	-4214.119	0.009	519.081	0.002
ROTOR						
LEFT ROTOR	1027.526	-106.637	-4403.372	71111.531	-1027.133	11649.072
RIGHT ROTOR	1027.525	106.636	-4403.364	-71111.422	-1027.133	-11649.055
HUB SPINNER	-255.515	0.000	21.517	0.000	1534.874	0.000
TOTAL ROTOR	1799.536	0.000	-8785.219	0.109	-519.392	0.018
TOTAL AIRCRAFT (BODY AXIS)	148.725	-0.001	-12999.338	0.118	-0.311	0.020
TOTAL AIRCRAFT (INERTIAL AXIS)	0.100	0.000	-0.186	0.118	-0.311	0.023

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52487.5, IYY = 21191.4, IZZ = 66473.9, DRIVEI = 824.0 SLUG-FT2

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.4216	0.0000	-1.2221	0.0000	-0.0907	0.0000
	ROTOR	0.0000	-0.2525	0.0000	-0.9855	0.0000	-0.0991	0.0000
	AIRFRM	0.0000	-0.1691	0.0000	-0.2366	0.0000	0.0085	0.0000
Q	TOTAL	0.5761	0.0000	-1.8909	0.0000	-0.9512	0.0000	0.1443
	ROTOR	0.6309	0.0000	-0.0004	0.0000	-0.1535	0.0000	0.1443
	AIRFRM	-0.0547	0.0000	-1.8905	0.0000	-0.7977	0.0000	0.0000
R	TOTAL	0.0000	0.7427	0.0000	0.0469	0.0000	-0.1449	0.0000
	ROTOR	0.0000	-0.0997	0.0000	-0.0561	0.0000	-0.0099	0.0000
	AIRFRM	0.0000	0.8424	0.0000	0.1031	0.0000	-0.1350	0.0000
U	TOTAL	-0.0959	0.0000	-0.0947	0.0000	0.0103	0.0000	-0.0121
	ROTOR	-0.0269	0.0000	0.0458	0.0000	0.0025	0.0000	-0.0121
	AIRFRM	-0.0690	0.0000	-0.1406	0.0000	0.0078	0.0000	0.0000
V	TOTAL	0.0000	-0.0894	0.0000	-0.0025	0.0000	0.0030	0.0000
	ROTOR	0.0000	-0.0111	0.0000	-0.0003	0.0000	0.0002	0.0000
	AIRFRM	0.0000	-0.0783	0.0000	-0.0022	0.0000	0.0028	0.0000
W	TOTAL	0.1320	0.0000	-0.7079	0.0000	-0.0076	0.0000	0.0368
	ROTOR	0.1021	0.0000	-0.3699	0.0000	-0.0033	0.0000	0.0368
	AIRFRM	0.0299	0.0000	-0.3380	0.0000	-0.0043	0.0000	0.0000
RPM	TOTAL	0.2267	0.0000	-0.8472	0.0000	-0.0231	0.0000	0.5367
	ROTOR	0.2287	0.0000	-0.8253	0.0000	-0.0091	0.0000	0.5367
	AIRFRM	-0.0020	0.0000	-0.0219	0.0000	-0.0140	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	1.2173	0.0000	-5.4458	0.0000	-0.1041	0.0000	-0.6780
	ROTOR	1.2336	0.0000	-5.3206	0.0000	-0.0158	0.0000	-0.6780
	AIRFRM	-0.0163	0.0000	-0.1252	0.0000	-0.0884	0.0000	0.0000
XTHEG	TOTAL	0.8665	0.0000	-3.9559	0.0000	-0.0796	0.0000	2.1505
	ROTOR	0.8783	0.0000	-3.8655	0.0000	-0.0155	0.0000	2.1505
	AIRFRM	-0.0118	0.0000	-0.0904	0.0000	-0.0641	0.0000	0.0000
XLN	TOTAL	0.3015	0.0000	1.3240	0.0000	-0.3184	0.0000	-0.6315
	ROTOR	0.3135	0.0000	1.8376	0.0000	-0.1201	0.0000	-0.6315
	AIRFRM	-0.0120	0.0000	-0.5136	0.0000	-0.1983	0.0000	0.0000
XLT	TOTAL	0.0000	-0.1394	0.0000	0.3149	0.0000	0.0347	0.0000
	ROTOR	0.0000	-0.1394	0.0000	0.2686	0.0000	0.0334	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0463	0.0000	0.0013	0.0000
XPD	TOTAL	0.0000	-0.4777	0.0000	-0.0529	0.0000	0.0798	0.0000
	ROTOR	0.0000	0.0492	0.0000	-0.0409	0.0000	0.0077	0.0000
	AIRFRM	0.0000	-0.5269	0.0000	-0.0120	0.0000	0.0721	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =100.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	168.8	0.0000E+00	-.9537E-06
ACCEL	(FPS2)	0.7406E-06	0.9986E-07	-.6007E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	168.3	-.7221E-07	-12.92	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.5609E-05	0.1393E-01	-.5293E-06

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	100.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		33.86
ANGLE OF ATTACK	(DEG)	-4.391
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-4.391
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5249E+05
IXZ	1208.
IYY	0.2119E+05
IZZ	0.6647E+05

CENTER OF GRAVITY (IN)

S.L.	299.9
B.L.	0.0000E+00
W.L.	80.80

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	5.4037	54.04
LONG	(FWD)	6.4627	67.32
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	704.1	6279.	2.944	935.0	0.8375
RIGHT	704.1	6279.	2.944	935.0	0.8375
ENGINE	767.1				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETAO	45.1441	45.1441
B1	3.4347	3.4347
A1	0.0000	0.0000

ROTOR — FLAPPING

	AO (DEG)	LONG (DEG)	LAT (DEG)
LEFT	2.2432	-0.2389	2.5810
RIGHT	2.2432	-0.2389	2.5810

ROTOR — FORCES - MAST AXIS / JET

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	4627.42	189.76	-39.74	27.36
RIGHT	4627.42	189.76	-39.74	27.36

SURFACE POSITIONS (DEG)

ELEVATOR	7.8730
AILERON	0.0000
RUDDER	0.0000

ROTOR

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.4421	0.2065	11.2708	0.0872	0.000724	0.006672	0.015705
RIGHT	0.4421	0.2065	11.2708	0.0872	0.000724	0.006672	0.015705

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00156	0.01039	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00156	0.01039				

TIME USED FOR THIS TRIM = 0.0235 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =100.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-106.914	0.000	-102.357	0.000	-4990.424	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-2050.597	0.000	-3966.881	-0.005	2561.771	0.000
TOTAL	-2050.597	0.000	-3966.881	-0.005	2561.771	0.000
ENGINE PYLONS	-487.246	0.000	85.477	0.000	780.470	0.000
HORIZ. STAB.	-11.025	0.000	60.879	0.000	1340.167	0.000
VERT. STAB.						
FIN NO. 1	-4.904	0.000	0.000	0.000	14.257	-31.468
FIN NO. 2	-4.904	0.000	0.000	0.000	14.257	31.468
TOTAL	-9.808	0.000	0.000	0.000	28.515	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	7.081	0.000	-26.428	425.044	-11.640	113.890
RIGHT ENG	7.081	0.000	-26.428	-425.044	-11.640	-113.890
TOTAL	14.163	0.000	-52.855	0.000	-23.280	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2651.427	0.000	-3975.736	-0.005	-302.782	0.000
ROTOR						
LEFT ROTOR	1014.397	-39.129	-4518.839	73871.188	-952.990	10137.557
RIGHT ROTOR	1014.397	39.129	-4518.839	-73871.188	-952.990	-10137.557
HUB SPINNER	-372.629	0.000	51.820	0.000	2213.923	0.000
TOTAL ROTOR	1656.166	0.000	-8985.857	0.000	307.943	0.000
TOTAL AIRCRAFT (BODY AXIS)	-995.261	0.000	-12961.594	-0.005	5.161	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.017	0.000	0.251	-0.005	5.161	-0.001

STABILITY DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52487.5, IYY = 21191.4, IZZ = 66473.9, DRIVEI = 824.0 SLUG-FT2

*** VT =100.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.5088	0.0000	-1.4597	0.0000	-0.0468	0.0000
	ROTOR	0.0000	-0.2247	0.0000	-1.0453	0.0000	-0.0978	0.0000
	AIRFRM	0.0000	-0.2841	0.0000	-0.4144	0.0000	0.0510	0.0000
Q	TOTAL	0.3186	0.0000	-2.3548	0.0000	-1.0134	0.0000	-0.3400
	ROTOR	0.4791	0.0000	-0.2747	0.0000	-0.1320	0.0000	-0.3400
	AIRFRM	-0.1606	0.0000	-2.0801	0.0000	-0.8814	0.0000	0.0000
R	TOTAL	0.0000	1.3255	0.0000	0.0463	0.0000	-0.2402	0.0000
	ROTOR	0.0000	-0.0908	0.0000	-0.0895	0.0000	-0.0181	0.0000
	AIRFRM	0.0000	1.4162	0.0000	0.1358	0.0000	-0.2221	0.0000
U	TOTAL	-0.1272	0.0000	-0.0699	0.0000	0.0154	0.0000	-0.0392
	ROTOR	-0.0379	0.0000	0.0683	0.0000	0.0033	0.0000	-0.0392
	AIRFRM	-0.0893	0.0000	-0.1382	0.0000	0.0120	0.0000	0.0000
V	TOTAL	0.0000	-0.1297	0.0000	-0.0044	0.0000	0.0050	0.0000
	ROTOR	0.0000	-0.0170	0.0000	-0.0010	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-0.1127	0.0000	-0.0034	0.0000	0.0051	0.0000
W	TOTAL	0.0832	0.0000	-0.9086	0.0000	-0.0116	0.0000	0.1148
	ROTOR	0.1089	0.0000	-0.3727	0.0000	-0.0039	0.0000	0.1148
	AIRFRM	-0.0256	0.0000	-0.5359	0.0000	-0.0077	0.0000	0.0000
RPM	TOTAL	0.2902	0.0000	-1.0456	0.0000	-0.0304	0.0000	0.9306
	ROTOR	0.2912	0.0000	-1.0222	0.0000	-0.0123	0.0000	0.9306
	AIRFRM	-0.0011	0.0000	-0.0234	0.0000	-0.0181	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	1.3088	0.0000	-5.7361	0.0000	-0.1145	0.0000	0.0534
	ROTOR	1.3196	0.0000	-5.6272	0.0000	-0.0162	0.0000	0.0534
	AIRFRM	-0.0107	0.0000	-0.1089	0.0000	-0.0982	0.0000	0.0000
XTHEG	TOTAL	0.9339	0.0000	-4.1986	0.0000	-0.0894	0.0000	2.8312
	ROTOR	0.9421	0.0000	-4.1208	0.0000	-0.0176	0.0000	2.8312
	AIRFRM	-0.0082	0.0000	-0.0779	0.0000	-0.0718	0.0000	0.0000
XLN	TOTAL	0.2332	0.0000	1.5200	0.0000	-0.4028	0.0000	-0.9912
	ROTOR	0.2807	0.0000	2.2469	0.0000	-0.1266	0.0000	-0.9912
	AIRFRM	-0.0476	0.0000	-0.7269	0.0000	-0.2762	0.0000	0.0000
XLT	TOTAL	0.0000	-0.1270	0.0000	0.3589	0.0000	0.0324	0.0000
	ROTOR	0.0000	-0.1270	0.0000	0.2885	0.0000	0.0322	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0704	0.0000	0.0002	0.0000
XPD	TOTAL	0.0000	-0.6743	0.0000	-0.0665	0.0000	0.1083	0.0000
	ROTOR	0.0000	0.0577	0.0000	-0.0498	0.0000	0.0081	0.0000
	AIRFRM	0.0000	-0.7320	0.0000	-0.0167	0.0000	0.1001	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =120.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	202.5	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.1560E-03	0.1242E-06	-.2003E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	200.7	-.2042E-06	-27.41	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.2517E-05	0.3831E-02	-.6382E-06

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT.(FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED	(KNOTS)	120.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	48.75
ANGLE OF ATTACK	(DEG)	-7.777
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-7.777
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5249E+05	S.L.	299.9
IXZ	1208.	B.L.	0.0000E+00
IYY	0.2119E+05	W.L.	80.80
IZZ	0.6647E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	7.1271	71.27
LONG	(FWD)	7.6460	79.65
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	1037.	9251.	3.937	968.1	0.8671
RIGHT	1037.	9251.	3.937	968.1	0.8671
ENGINE	1126.				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	48.5933	48.5933
B1	5.8427	5.8427
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	13.4758
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	2.4465	-0.7371	2.5174	5274.38	251.05	-101.49	36.63
RIGHT	2.4465	-0.7371	2.5174	5274.38	251.05	-101.49	36.63

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.3986	0.2422	10.7567	0.1155	0.001067	0.007605	0.021828
RIGHT	0.3986	0.2422	10.7567	0.1155	0.001067	0.007605	0.021828

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	0.00452	0.00964	0.01000	0.85000	0.35000	0.20000
RIGHT	0.00452	0.00964				

TIME USED FOR THIS TRIM = 0.0205 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-191.242	0.000	16.661	0.000	-10426.799	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-2645.270	0.000	-3070.439	0.002	1390.490	0.000
TOTAL	-2645.270	0.000	-3070.439	0.002	1390.490	0.000
ENGINE PYLONS	-690.470	0.000	148.206	0.000	1106.314	0.000
HORIZ. STAB.	25.136	0.000	323.351	0.000	6963.262	0.000
VERT. STAB.						
FIN NO. 1	-8.665	0.000	0.000	0.000	25.191	-55.600
FIN NO. 2	-8.665	0.000	0.000	0.000	25.191	55.600
TOTAL	-17.330	0.000	0.000	0.000	50.382	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	9.480	0.000	-35.378	568.998	-15.582	152.463
RIGHT ENG	9.480	0.000	-35.378	-568.998	-15.582	-152.463
TOTAL	18.959	0.000	-70.756	0.000	-31.165	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-3500.217	0.000	-2652.977	0.002	-947.515	-0.001
ROTOR						
LEFT ROTOR	1122.900	11.427	-5160.561	85336.406	-1010.310	9086.827
RIGHT ROTOR	1122.900	-11.427	-5160.561	-85336.406	-1010.310	-9086.827
HUB SPINNER	-504.553	0.000	93.729	0.000	2969.552	0.000
TOTAL ROTOR	1741.248	0.000	-10227.392	0.000	948.932	0.000
TOTAL AIRCRAFT (BODY AXIS)	-1758.969	0.000	-12880.369	0.002	1.417	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.073	0.000	0.072	0.002	1.417	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52487.5, IYY = 21191.4, IZZ = 66473.9, DRIVEI = 824.0 SLUG-FT2

*** VT =120.00 KTS *** NACELLE INCIDENCE = 75.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 299.86 WLCG = 80.80 ***
*** MAST ANGLE = 15.00 DEG ***** FLAP SETTING = 40/25 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.8748	0.0000	-1.5897	0.0000	0.0261	0.0000
	ROTOR	0.0000	-0.4613	0.0000	-1.0958	0.0000	-0.0709	0.0000
	AIRFRM	0.0000	-0.4134	0.0000	-0.4939	0.0000	0.0970	0.0000
Q	TOTAL	0.1437	0.0000	-2.8627	0.0000	-1.1426	0.0000	-0.4817
	ROTOR	0.5886	0.0000	-0.4863	0.0000	-0.1450	0.0000	-0.4817
	AIRFRM	-0.4449	0.0000	-2.3763	0.0000	-0.9976	0.0000	0.0000
R	TOTAL	0.0000	1.8805	0.0000	0.0603	0.0000	-0.3521	0.0000
	ROTOR	0.0000	-0.1748	0.0000	-0.1041	0.0000	-0.0335	0.0000
	AIRFRM	0.0000	2.0553	0.0000	0.1645	0.0000	-0.3186	0.0000
U	TOTAL	-0.1593	0.0000	-0.0557	0.0000	0.0133	0.0000	-0.0337
	ROTOR	-0.0535	0.0000	0.0848	0.0000	0.0049	0.0000	-0.0337
	AIRFRM	-0.1057	0.0000	-0.1405	0.0000	0.0085	0.0000	0.0000
V	TOTAL	0.0000	-0.1774	0.0000	-0.0068	0.0000	0.0076	0.0000
	ROTOR	0.0000	-0.0272	0.0000	-0.0020	0.0000	-0.0002	0.0000
	AIRFRM	0.0000	-0.1502	0.0000	-0.0048	0.0000	0.0078	0.0000
W	TOTAL	0.0379	0.0000	-1.0070	0.0000	-0.0075	0.0000	0.1699
	ROTOR	0.1077	0.0000	-0.3626	0.0000	-0.0038	0.0000	0.1699
	AIRFRM	-0.0698	0.0000	-0.6444	0.0000	-0.0037	0.0000	0.0000
RPM	TOTAL	0.3667	0.0000	-1.2973	0.0000	-0.0207	0.0000	1.9790
	ROTOR	0.3624	0.0000	-1.3022	0.0000	-0.0152	0.0000	1.9790
	AIRFRM	0.0043	0.0000	0.0049	0.0000	-0.0056	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	1.3222	0.0000	-5.7308	0.0000	-0.0336	0.0000	0.7336
	ROTOR	1.3151	0.0000	-5.7969	0.0000	-0.0095	0.0000	0.7336
	AIRFRM	0.0071	0.0000	0.0661	0.0000	-0.0241	0.0000	0.0000
XTHEG	TOTAL	0.9629	0.0000	-4.2229	0.0000	-0.0343	0.0000	3.7619
	ROTOR	0.9585	0.0000	-4.2746	0.0000	-0.0166	0.0000	3.7619
	AIRFRM	0.0044	0.0000	0.0517	0.0000	-0.0177	0.0000	0.0000
XLN	TOTAL	0.2623	0.0000	1.4952	0.0000	-0.5582	0.0000	-1.4004
	ROTOR	0.4168	0.0000	2.5543	0.0000	-0.1508	0.0000	-1.4004
	AIRFRM	-0.1545	0.0000	-1.0591	0.0000	-0.4074	0.0000	0.0000
XLT	TOTAL	0.0000	-0.1333	0.0000	0.3992	0.0000	0.0246	0.0000
	ROTOR	0.0000	-0.1333	0.0000	0.2994	0.0000	0.0252	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0999	0.0000	-0.0005	0.0000
XPD	TOTAL	0.0000	-0.9799	0.0000	-0.0806	0.0000	0.1559	0.0000
	ROTOR	0.0000	0.0742	0.0000	-0.0565	0.0000	0.0117	0.0000
	AIRFRM	0.0000	-1.0541	0.0000	-0.0240	0.0000	0.1442	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL

CONFIGURATION:

NACELLE INCIDENCE	75.0 DEG	GEAR	0.0 % DOWN	ALTITUDE	
FLAP SETTING	40/25 DEG	STAB INCIDENCE	0.000 DEG	PRES(MSL)	0.0 FT
ROTOR RPM	589.0 RPM	INERTIA, SLUG-FT2		DENSITY	0.0 FT
GROSS WEIGHT	13000.0 LB	IXX 52488.	IXZ 1207.6	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	299.858 IN	IYY 21191.	IZZ 66474.	TEMP(OAT)	15.00 DEG-C
W.L.	80.803 IN	SIGMAP	1.00000 -ND-	VSOUND	661.48 KTS
		RHO	0.0023769 SLG/FT3	WIND-V	0.00 KTS

U/VKCAS -KTS — NOTE: SYMBOL INDICATES A TRIM PROBLEM

	40.00	60.00	80.00	100.00	120.00	0.00	0.00	0.00
	40.00	60.00	80.00	100.00	120.00	0.00	0.00	0.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	35.4859	47.3128	57.7074	67.3200	79.6458	0.0000	0.0000	0.0000
XLT,%	50.0000	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000
XCOL,%	49.4648	42.7530	44.8965	54.0369	71.2710	0.0000	0.0000	0.0000
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	-2.7844	-0.4739	1.5568	3.4347	5.8427	0.0000	0.0000	0.0000
THETO,DEG	42.8358	41.8044	42.6151	45.1441	48.5933	0.0000	0.0000	0.0000
THOG,DEG	1.2870	1.2121	1.7173	2.9439	3.9372	0.0000	0.0000	0.0000
ELEVATOR,DEG	-6.5975	-1.2215	3.5035	7.8730	13.4758	0.0000	0.0000	0.0000
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	2.9900	1.3843	0.2945	-0.2389	-0.7371	0.0000	0.0000	0.0000
LTFLP,DEG	6.0129	4.4837	3.0553	2.5810	2.5174	0.0000	0.0000	0.0000
THRUST,LB	5706.9	5013.0	4520.5	4627.4	5274.4	0.00000E+00	0.00000E+00	0.00000E+00
CT	0.0082	0.0072	0.0065	0.0067	0.0076	0.0000	0.0000	0.0000
H-FORCE,LB	329.24	189.03	147.18	189.76	251.05	0.00000E+00	0.00000E+00	0.00000E+00
Y-FORCE,LB	272.36	141.81	29.771	-39.742	-101.49	0.00000E+00	0.00000E+00	0.00000E+00
HORSEPOWER	621.23	506.45	540.43	704.12	1037.5	0.00000E+00	0.00000E+00	0.00000E+00
Q,FT-LB	5539.5	4516.0	4819.0	6278.7	9251.2	0.00000E+00	0.00000E+00	0.00000E+00
CP	0.0006	0.0005	0.0006	0.0007	0.0011	0.0000	0.0000	0.0000
RPM,ROTOR	589.00	589.00	589.00	589.00	589.00	0.00000E+00	0.00000E+00	0.00000E+00
WI,FT/SEC	33.0144	20.3212	13.6776	11.2708	10.7567	0.0000	0.0000	0.0000
MU	0.0870	0.1296	0.1697	0.2065	0.2422	0.0000	0.0000	0.0000
LAMDA	0.0525	0.0478	0.0611	0.0872	0.1155	0.0000	0.0000	0.0000
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	8.5692	5.5827	0.6551	-4.3908	-7.7766	0.0000	0.0000	0.0000
PITCH,DEG	8.5692	5.5827	0.6551	-4.3908	-7.7766	0.0000	0.0000	0.0000
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	5.4168	12.1878	21.6672	33.8550	48.7512	0.0000	0.0000	0.0000
MACH NUMBER	0.0605	0.0907	0.1209	0.1512	0.1814	0.0000	0.0000	0.0000
VT,KNOTS	40.0000	60.0000	80.0000	100.0000	120.0000	0.0000	0.0000	0.0000
VKCAS,KNOTS	39.9997	60.0003	80.0000	100.0002	119.9999	0.0000	0.0000	0.0000
HP-ENG	677.96	554.61	591.06	767.09	1125.5	0.00000E+00	0.00000E+00	0.00000E+00

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0017 MIN TOTAL TIME USED IN THIS RUN = 0.3792 MIN

TIME: 22:25:52
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:25:52

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	30.0 degrees
Nacelle Incidence	=	60.0 degrees
Rotor Speed	=	589.0 RPM
Flap/Flaperon Position	=	20/12.5 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	80, 100, 120, 140 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		----- EARTH REFERENCE ----- UE	VE	WE
RATE	(FPS)	135.0	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.1028E-01	0.9560E-07	0.8395E-02

	---------- BODY REFERENCE ---------- UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	133.1	0.6367E-07	22.79	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.8692E-05	-.1781E-01	-.3540E-05

----- ATMOSPHERIC CONDITIONS -----	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----		
CAL. AIRSPEED	(KNOTS)	80.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		21.67
ANGLE OF ATTACK	(DEG)	9.717
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	9.717
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)		----- CENTER OF GRAVITY ----- (IN)	
IXX	0.5218E+05	S.L.	298.8
IXZ	1181.	B.L.	0.0000E+00
IYY	0.2102E+05	W.L.	79.64
IZZ	0.6661E+05		

----- CONTROL DISPLACEMENTS -----	(+)	(IN)	(PER)
COLL	(UP)	4.1729	41.73
LONG	(FWD)	4.4945	46.82
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ----------	POWER (SHP)	TORQUE (FT-LBS)	---------- BLADE ---------- GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	494.7	4411.	-1.084	890.5	0.7976
RIGHT	494.7	4411.	-1.084	890.5	0.7976
ENGINE	541.9				

----- SWASH PLATE ANGLE (DEG) ----	LEFT ROTOR	RIGHT ROTOR
THETAO	42.1311	42.1311
B1	-0.3520	-0.3520
A1	0.0000	0.0000

------- SURFACE POSITIONS ------- (DEG)	
ELEVATOR	-1.4465
AILERON	0.0000
RUDDER	0.0000

---------- ROTOR ---------- FLAPPING ----------	AO (DEG)	LONG (DEG)	LAT (DEG)	---- FORCES - MAST AXIS ------ THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	1.8930	1.8586	2.7781	3512.68	259.56	-3.08	22.84
RIGHT	1.8930	1.8586	2.7781	3512.68	259.56	-3.08	22.84

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7600	0.1643	10.6776	0.0745	0.000509	0.005065	0.014043
RIGHT	0.7600	0.1643	10.6776	0.0745	0.000509	0.005065	0.014043

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00982	0.00968	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00982	0.00968				

TIME USED FOR THIS TRIM = 0.0083 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-24.436	0.000	-356.423	0.000	2386.497	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-312.541	0.000	-5777.320	0.000	4086.706	0.000
TOTAL	-312.541	0.000	-5777.320	0.000	4086.706	0.000
ENGINE PYLONS	-322.337	0.000	-18.192	0.000	545.102	0.000
HORIZ. STAB.	3.643	0.000	-260.157	0.000	-5670.249	0.000
VERT. STAB.						
FIN NO. 1	-1.755	0.000	0.000	0.000	5.272	-11.261
FIN NO. 2	-1.755	0.000	0.000	0.000	5.272	11.261
TOTAL	-3.510	0.000	0.000	0.000	10.545	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	11.421	0.000	-19.782	318.162	-21.389	183.691
RIGHT ENG	11.421	0.000	-19.782	-318.162	-21.389	-183.691
TOTAL	22.842	0.000	-39.564	0.000	-42.777	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-636.339	0.000	-6451.657	0.000	1315.823	0.000
ROTOR						
LEFT ROTOR	1531.352	-52.275	-3171.414	52629.461	-1363.509	20498.033
RIGHT ROTOR	1531.352	52.275	-3171.414	-52629.461	-1363.509	-20498.033
HUB SPINNER	-235.804	0.000	-23.068	0.000	1404.661	0.000
TOTAL ROTOR	2826.901	0.000	-6365.896	0.000	-1322.357	0.000
TOTAL AIRCRAFT (BODY AXIS)	2190.563	0.000	-12817.553	0.000	-6.533	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-3.521	0.000	-4.044	0.000	-6.533	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52180.0, IYY = 21022.8, IZZ = 66612.8, DRIVEI = 824.0 SLUG-FT2

****
*** VT = 80.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	0.1907	0.0000	-1.1170	0.0000	-0.3110	0.0000
	ROTOR	0.0000	0.3204	0.0000	-0.8771	0.0000	-0.2807	0.0000
	AIRFRM	0.0000	-0.1297	0.0000	-0.2400	0.0000	-0.0302	0.0000
Q	TOTAL	0.2298	0.0000	-2.0976	0.0000	-0.8347	0.0000	0.8481
	ROTOR	0.0409	0.0000	-0.3123	0.0000	-0.0672	0.0000	0.8481
	AIRFRM	0.1889	0.0000	-1.7853	0.0000	-0.7675	0.0000	0.0000
R	TOTAL	0.0000	0.8009	0.0000	-0.1827	0.0000	-0.1945	0.0000
	ROTOR	0.0000	0.1697	0.0000	-0.2796	0.0000	-0.0938	0.0000
	AIRFRM	0.0000	0.6312	0.0000	0.0968	0.0000	-0.1007	0.0000
U	TOTAL	-0.1273	0.0000	-0.0519	0.0000	0.0109	0.0000	-0.0419
	ROTOR	-0.0826	0.0000	0.1246	0.0000	0.0041	0.0000	-0.0419
	AIRFRM	-0.0447	0.0000	-0.1765	0.0000	0.0068	0.0000	0.0000
V	TOTAL	0.0000	-0.0782	0.0000	-0.0011	0.0000	0.0023	0.0000
	ROTOR	0.0000	-0.0096	0.0000	0.0003	0.0000	0.0001	0.0000
	AIRFRM	0.0000	-0.0686	0.0000	-0.0013	0.0000	0.0022	0.0000
W	TOTAL	0.2605	0.0000	-0.7032	0.0000	-0.0204	0.0000	0.0907
	ROTOR	0.1822	0.0000	-0.3273	0.0000	-0.0059	0.0000	0.0907
	AIRFRM	0.0783	0.0000	-0.3759	0.0000	-0.0145	0.0000	0.0000
RPM	TOTAL	0.3741	0.0000	-0.7008	0.0000	-0.0192	0.0000	0.5234
	ROTOR	0.3761	0.0000	-0.6973	0.0000	-0.0127	0.0000	0.5234
	AIRFRM	-0.0020	0.0000	-0.0035	0.0000	-0.0065	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.0538	0.0000	-4.0293	0.0000	-0.0879	0.0000	-1.0204
	ROTOR	2.0720	0.0000	-4.0216	0.0000	-0.0511	0.0000	-1.0204
	AIRFRM	-0.0181	0.0000	-0.0076	0.0000	-0.0368	0.0000	0.0000
XTHEG	TOTAL	1.8139	0.0000	-3.7296	0.0000	-0.0773	0.0000	2.3962
	ROTOR	1.8299	0.0000	-3.7216	0.0000	-0.0436	0.0000	2.3962
	AIRFRM	-0.0159	0.0000	-0.0080	0.0000	-0.0337	0.0000	0.0000
XLN	TOTAL	-0.3662	0.0000	1.0641	0.0000	-0.2673	0.0000	-0.8183
	ROTOR	-0.3954	0.0000	1.5833	0.0000	-0.0614	0.0000	-0.8183
	AIRFRM	0.0292	0.0000	-0.5192	0.0000	-0.2059	0.0000	0.0000
XLT	TOTAL	0.0000	-0.1071	0.0000	0.2905	0.0000	0.0867	0.0000
	ROTOR	0.0000	-0.1071	0.0000	0.2436	0.0000	0.0818	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0470	0.0000	0.0048	0.0000
XPD	TOTAL	0.0000	-0.4692	0.0000	-0.0487	0.0000	0.0637	0.0000
	ROTOR	0.0000	0.0319	0.0000	-0.0367	0.0000	-0.0049	0.0000
	AIRFRM	0.0000	-0.5011	0.0000	-0.0119	0.0000	0.0686	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****

*** VT =100.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

****

		----- EARTH REFERENCE ----- UE	VE	WE
RATE	(FPS)	168.8	-.1776E-14	0.0000E+00
ACCEL	(FPS2)	0.1153E-01	-.3489E-06	-.1905E-02

	---------- BODY REFERENCE ---------- UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	168.6	-.2346E-07	8.396	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1713E-04	-.2665E-01	-.6052E-05

----- ATMOSPHERIC CONDITIONS -----		----- FLIGHT PATH CONDITIONS -----		----- INERTIAS ----- (SLUGS-FT2)		----- CENTER OF GRAVITY ----- (IN)	
ALTITUDE (FT)	5000.00	CAL. AIRSPEED (KNOTS)	100.01				
DENSITY ALT. (FT)	0.00	RATE OF DECENT (FPS)	0.00				
PRESSURE ALT. (FT)	0.00	G-LEVEL (G S)	1.00	IXX	0.5218E+05	S.L.	298.8
AMBIENT TEMP (DEG-R)	288.16	DYN PRES (SLUGS/FT-SEC2)	33.86	IXZ	1181.	B.L.	0.0000E+00
OUTSIDE AIR TEMP (DEG-C)	15.00	ANGLE OF ATTACK (DEG)	2.851	IYY	0.2102E+05	W.L.	79.64
AIR DENSITY (SLUGS/FT3)	0.2377E-02	FLIGHT PATH ANGLE (DEG)	0.000	IZZ	0.6661E+05		
		SIDESLIP ANGLE (DEG)	0.000				
THETES (ND)	1.00000	ROLL ANGLE (DEG)	0.000				
DELSTD (ND)	1.00000	PITCH ANGLE (DEG)	2.851				
SIGMA PRIME (ND)	1.00000	YAW ANGLE (DEG)	0.000				

----- CONTROL DISPLACEMENTS -----	(+)	(IN)	(PER)
COLL	(UP)	4.8143	48.14
LONG	(FWD)	5.7913	60.33
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ----------	POWER (SHP)	TORQUE (FT-LBS)	---------- BLADE ---------- GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	603.4	5380.	1.181	921.0	0.8250
RIGHT	603.4	5380.	1.181	921.0	0.8250
ENGINE	658.7				

----- SWASH PLATE ANGLE (DEG) ----	LEFT ROTOR	RIGHT ROTOR
THETA0	45.1215	45.1215
B1	1.9952	1.9952
A1	0.0000	0.0000

---------- ROTOR ---------- ---------- FLAPPING ----------	AO (DEG)	LONG (DEG)	LAT (DEG)	---- FORCES - MAST AXIS ------ THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	1.8252	0.7458	2.0952	3296.78	327.50	-79.56	21.01
RIGHT	1.8252	0.7458	2.0952	3296.78	327.50	-79.56	21.01

------- SURFACE POSITIONS ------- (DEG)	
ELEVATOR	4.6937
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6944	0.1948	8.0926	0.1103	0.000621	0.004753	0.013915
RIGHT	0.6944	0.1948	8.0926	0.1103	0.000621	0.004753	0.013915

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00438	0.00888	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00438	0.00888				

TIME USED FOR THIS TRIM = 0.0275 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =100.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
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*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-75.825	0.000	-336.318	0.000	-227.717	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1173.146	0.000	-6296.610	-0.004	5578.752	0.000
TOTAL	-1173.146	0.000	-6296.610	-0.004	5578.752	0.000
ENGINE PYLONS	-491.667	0.000	7.915	0.000	835.076	0.000
HORIZ. STAB.	-22.199	0.000	-279.699	0.000	-6045.340	0.000
VERT. STAB.						
FIN NO. 1	-5.029	0.000	0.000	0.000	15.109	-32.271
FIN NO. 2	-5.029	0.000	0.000	0.000	15.109	32.271
TOTAL	-10.058	0.000	0.000	0.000	30.219	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	10.506	0.000	-18.197	292.670	-19.675	168.973
RIGHT ENG	10.506	0.000	-18.197	-292.670	-19.675	-168.973
TOTAL	21.012	0.000	-36.394	0.000	-39.350	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1751.883	0.000	-6941.107	-0.004	131.639	-0.001
ROTOR						
LEFT ROTOR	1365.255	26.858	-3019.584	51246.887	-1012.921	17231.672
RIGHT ROTOR	1365.255	-26.858	-3019.584	-51246.887	-1012.921	-17231.672
HUB SPINNER	-327.356	0.000	-2.631	0.000	1884.423	0.000
TOTAL ROTOR	2403.155	0.000	-6041.799	0.000	-141.418	0.000
TOTAL AIRCRAFT (BODY AXIS)	651.272	0.000	-12982.906	-0.004	-9.780	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	4.613	0.000	1.002	-0.004	-9.780	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52180.0, IYY = 21022.8, IZZ = 66612.8, DRIVEI = 824.0 SLUG-FT2

****
*** VT =100.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	0.2140	0.0000	-1.2613	0.0000	-0.2841	0.0000
	ROTOR	0.0000	0.5102	0.0000	-0.9192	0.0000	-0.2939	0.0000
	AIRFRM	0.0000	-0.2963	0.0000	-0.3421	0.0000	0.0098	0.0000
Q	TOTAL	-0.2509	0.0000	-2.9337	0.0000	-0.9712	0.0000	-0.4225
	ROTOR	-0.2620	0.0000	-0.7137	0.0000	-0.0176	0.0000	-0.4225
	AIRFRM	0.0111	0.0000	-2.2200	0.0000	-0.9536	0.0000	0.0000
R	TOTAL	0.0000	1.7511	0.0000	-0.1907	0.0000	-0.3312	0.0000
	ROTOR	0.0000	0.3007	0.0000	-0.3118	0.0000	-0.1124	0.0000
	AIRFRM	0.0000	1.4505	0.0000	0.1211	0.0000	-0.2188	0.0000
U	TOTAL	-0.1670	0.0000	-0.0284	0.0000	0.0144	0.0000	-0.1049
	ROTOR	-0.1034	0.0000	0.1414	0.0000	0.0057	0.0000	-0.1049
	AIRFRM	-0.0636	0.0000	-0.1698	0.0000	0.0087	0.0000	0.0000
V	TOTAL	0.0000	-0.1290	0.0000	-0.0025	0.0000	0.0054	0.0000
	ROTOR	0.0000	-0.0158	0.0000	-0.0005	0.0000	-0.0003	0.0000
	AIRFRM	0.0000	-0.1133	0.0000	-0.0020	0.0000	0.0057	0.0000
W	TOTAL	0.2635	0.0000	-0.8396	0.0000	-0.0248	0.0000	0.1856
	ROTOR	0.1923	0.0000	-0.3254	0.0000	-0.0070	0.0000	0.1856
	AIRFRM	0.0712	0.0000	-0.5142	0.0000	-0.0179	0.0000	0.0000
RPM	TOTAL	0.4920	0.0000	-0.8817	0.0000	-0.0309	0.0000	0.8598
	ROTOR	0.4946	0.0000	-0.8719	0.0000	-0.0185	0.0000	0.8598
	AIRFRM	-0.0026	0.0000	-0.0098	0.0000	-0.0123	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.2803	0.0000	-4.2729	0.0000	-0.1245	0.0000	-0.1754
	ROTOR	2.2981	0.0000	-4.2348	0.0000	-0.0655	0.0000	-0.1754
	AIRFRM	-0.0178	0.0000	-0.0381	0.0000	-0.0589	0.0000	0.0000
XTHEG	TOTAL	1.9790	0.0000	-3.9944	0.0000	-0.1064	0.0000	3.2726
	ROTOR	1.9964	0.0000	-3.9614	0.0000	-0.0522	0.0000	3.2726
	AIRFRM	-0.0174	0.0000	-0.0330	0.0000	-0.0542	0.0000	0.0000
XLN	TOTAL	-0.5381	0.0000	1.0597	0.0000	-0.3765	0.0000	-1.3321
	ROTOR	-0.5245	0.0000	1.8609	0.0000	-0.0598	0.0000	-1.3321
	AIRFRM	-0.0136	0.0000	-0.8011	0.0000	-0.3167	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0772	0.0000	0.3390	0.0000	0.0916	0.0000
	ROTOR	0.0000	-0.0772	0.0000	0.2623	0.0000	0.0868	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0767	0.0000	0.0048	0.0000
XPD	TOTAL	0.0000	-0.7463	0.0000	-0.0625	0.0000	0.1010	0.0000
	ROTOR	0.0000	0.0366	0.0000	-0.0439	0.0000	-0.0062	0.0000
	AIRFRM	0.0000	-0.7829	0.0000	-0.0186	0.0000	0.1072	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	202.5	0.3553E-14	0.4768E-06
ACCEL	(FPS2)	0.9510E-04	0.3489E-07	-.4517E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	202.4	-.3155E-07	-6.775	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.2968E-05	0.2129E-03	-.8270E-06

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		120.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		48.75
ANGLE OF ATTACK (DEG)		-1.917
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-1.917
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5218E+05	S.L.	298.8
IXZ	1181.	B.L.	0.0000E+00
IYY	0.2102E+05	W.L.	79.64
IZZ	0.6661E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	5.9686	59.69
LONG	(FWD)	6.8719	71.58
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	816.8	7283.	3.478	951.8	0.8525
RIGHT	816.8	7283.	3.478	951.8	0.8525
ENGINE	888.2				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	48.7225	48.7225
B1	3.9512	3.9512
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	9.8106
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.9379	0.3526	1.9924	3655.53	465.02	-145.13	23.52
RIGHT	1.9379	0.3526	1.9924	3655.53	465.02	-145.13	23.52

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6429	0.2230	7.5311	0.1486	0.000840	0.005271	0.015439
RIGHT	0.6429	0.2230	7.5311	0.1486	0.000840	0.005271	0.015439

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	0.00121	0.00814	0.01000	0.85000	0.35000	0.20000
RIGHT	0.00121	0.00814				

TIME USED FOR THIS TRIM = 0.0242 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-139.299	0.000	-263.381	0.000	-4840.096	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1992.202	0.000	-5794.071	-0.003	6366.535	0.000
TOTAL	-1992.202	0.000	-5794.071	-0.003	6366.535	0.000
ENGINE PYLONS	-699.493	0.000	57.754	0.000	1192.780	0.000
HORIZ. STAB.	-37.806	0.000	-179.563	0.000	-3835.168	0.000
VERT. STAB.						
FIN NO. 1	-9.835	0.000	0.000	0.000	29.547	-63.106
FIN NO. 2	-9.835	0.000	0.000	0.000	29.547	63.106
TOTAL	-19.669	0.000	0.000	0.000	59.093	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	11.759	0.000	-20.367	327.566	-22.021	189.120
RIGHT ENG	11.759	0.000	-20.367	-327.566	-22.021	-189.120
TOTAL	23.518	0.000	-40.734	0.000	-44.041	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2864.952	0.000	-6219.995	-0.003	-1100.898	-0.001
ROTOR						
LEFT ROTOR	1426.096	85.804	-3399.966	58705.496	-630.184	16711.912
RIGHT ROTOR	1426.096	-85.804	-3399.966	-58705.496	-630.184	-16711.912
HUB SPINNER	-422.074	0.000	27.220	0.000	2361.344	0.000
TOTAL ROTOR	2430.118	0.000	-6772.712	0.000	1100.976	0.000
TOTAL AIRCRAFT (BODY AXIS)	-434.834	0.000	-12992.707	-0.003	0.078	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.039	0.000	0.017	-0.003	0.078	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52180.0, IYY = 21022.8, IZZ = 66612.8, DRIVEI = 824.0 SLUG-FT2

*** VT =120.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0001	0.1085	-0.0001	-1.3995	0.0000	-0.2214	0.0000
	ROTOR	0.0001	0.5858	-0.0001	-0.9710	0.0000	-0.2802	0.0000
	AIRFRM	0.0000	-0.4772	0.0000	-0.4285	0.0000	0.0588	0.0000
Q	TOTAL	-0.7075	0.0000	-3.5451	0.0000	-1.0823	0.0000	-1.0206
	ROTOR	-0.4761	0.0000	-0.9789	0.0000	0.0146	0.0000	-1.0206
	AIRFRM	-0.2313	0.0000	-2.5662	0.0000	-1.0969	0.0000	0.0000
R	TOTAL	0.0000	2.6827	0.0000	-0.1644	0.0000	-0.4657	0.0000
	ROTOR	0.0000	0.3445	0.0000	-0.3130	0.0000	-0.1193	0.0000
	AIRFRM	0.0000	2.3382	0.0000	0.1486	0.0000	-0.3464	0.0000
U	TOTAL	-0.1987	0.0000	-0.0269	0.0000	0.0111	0.0000	-0.1298
	ROTOR	-0.1182	0.0000	0.1450	0.0000	0.0072	0.0000	-0.1298
	AIRFRM	-0.0805	0.0000	-0.1719	0.0000	0.0038	0.0000	0.0000
V	TOTAL	0.0000	-0.1850	0.0000	-0.0042	0.0000	0.0090	0.0000
	ROTOR	0.0000	-0.0244	0.0000	-0.0013	0.0000	-0.0006	0.0000
	AIRFRM	0.0000	-0.1606	0.0000	-0.0029	0.0000	0.0096	0.0000
W	TOTAL	0.1840	0.0000	-0.9277	0.0000	-0.0197	0.0000	0.2736
	ROTOR	0.1936	0.0000	-0.3208	0.0000	-0.0072	0.0000	0.2736
	AIRFRM	-0.0096	0.0000	-0.6070	0.0000	-0.0125	0.0000	0.0000
RPM	TOTAL	0.6273	0.0000	-1.1036	0.0000	-0.0267	0.0000	1.8708
	ROTOR	0.6215	0.0000	-1.1163	0.0000	-0.0228	0.0000	1.8708
	AIRFRM	0.0057	0.0000	0.0127	0.0000	-0.0039	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.4370	0.0000	-4.3441	0.0000	-0.0858	0.0000	1.1373
	ROTOR	2.4305	0.0000	-4.4218	0.0000	-0.0709	0.0000	1.1373
	AIRFRM	0.0066	0.0000	0.0777	0.0000	-0.0149	0.0000	0.0000
XTHEG	TOTAL	2.0819	0.0000	-4.1073	0.0000	-0.0661	0.0000	4.4952
	ROTOR	2.0780	0.0000	-4.1835	0.0000	-0.0524	0.0000	4.4952
	AIRFRM	0.0038	0.0000	0.0762	0.0000	-0.0137	0.0000	0.0000
XLN	TOTAL	-0.6489	0.0000	0.9084	0.0000	-0.5478	0.0000	-1.9872
	ROTOR	-0.5440	0.0000	2.1120	0.0000	-0.0694	0.0000	-1.9872
	AIRFRM	-0.1048	0.0000	-1.2036	0.0000	-0.4783	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0678	0.0000	0.3894	0.0000	0.0912	0.0000
	ROTOR	0.0000	-0.0678	0.0000	0.2796	0.0000	0.0855	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1097	0.0000	0.0057	0.0000
XPD	TOTAL	0.0000	-1.0813	0.0000	-0.0772	0.0000	0.1493	0.0000
	ROTOR	0.0000	0.0461	0.0000	-0.0504	0.0000	-0.0050	0.0000
	AIRFRM	0.0000	-1.1274	0.0000	-0.0268	0.0000	0.1543	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =140.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	236.3	-.2842E-13	0.0000E+00
ACCEL	(FPS2)	-.4065E-06	-.4764E-08	-.1378E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	235.3	-.4329E-06	-21.13	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.7117E-05	0.2998E-02	0.3512E-05

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	140.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		66.36
ANGLE OF ATTACK	(DEG)	-5.130
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-5.130
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5218E+05
IXZ	1181.
IYY	0.2102E+05
IZZ	0.6661E+05

CENTER OF GRAVITY (IN)

S.L.	298.8
B.L.	0.0000E+00
W.L.	79.64

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	7.7377	77.38
LONG	(FWD)	7.6189	79.36
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE / BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	1197.	0.1067E+05	5.160	982.8	0.8803
RIGHT	1197.	0.1067E+05	5.160	982.8	0.8803
ENGINE	1297.				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	52.4033	52.4033
B1	5.3031	5.3031
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)

ELEVATOR	13.3474
AILERON	0.0000
RUDDER	0.0000

ROTOR — FLAPPING

	A0 (DEG)	LONG (DEG)	LAT (DEG)
LEFT	2.1686	0.8564	2.2962
RIGHT	2.1686	0.8564	2.2962

FORCES - MAST AXIS / JET

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	4389.78	690.17	-195.45	33.78
RIGHT	4389.78	690.17	-195.45	33.78

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.5739	0.2507	7.7847	0.1864	0.001231	0.006329	0.022112
RIGHT	0.5739	0.2507	7.7847	0.1864	0.001231	0.006329	0.022112

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	0.00692	0.00725	0.01000	0.85000	0.35000	0.20000
RIGHT	0.00692	0.00725				

TIME USED FOR THIS TRIM = 0.0205 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-222.810	0.000	-152.365	0.000	-10735.495	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-2641.744	0.000	-4599.629	0.007	6486.442	0.000
TOTAL	-2641.744	0.000	-4599.629	0.007	6486.442	0.000
ENGINE PYLONS	-944.430	0.000	124.774	0.000	1615.201	0.000
HORIZ. STAB.	-33.026	0.000	-25.285	0.000	-486.123	0.000
VERT. STAB.						
FIN NO. 1	-12.724	0.000	0.000	0.000	38.226	-81.640
FIN NO. 2	-12.724	0.000	0.000	0.000	38.226	81.645
TOTAL	-25.447	0.000	0.000	-0.001	76.451	0.005
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	16.890	0.000	-29.254	470.498	-31.629	271.642
RIGHT ENG	16.890	0.000	-29.254	-470.498	-31.629	-271.642
TOTAL	33.779	0.000	-58.508	0.000	-63.259	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-3833.678	0.000	-4711.014	0.006	-3106.783	0.004
ROTOR						
LEFT ROTOR	1598.651	123.048	-4149.069	72663.180	112.937	16614.385
RIGHT ROTOR	1598.651	-123.048	-4149.069	-72663.180	112.937	-16614.385
HUB SPINNER	-526.054	0.000	61.284	0.000	2882.010	0.000
TOTAL ROTOR	2671.249	0.000	-8236.854	0.000	3107.883	0.000
TOTAL AIRCRAFT (BODY AXIS)	-1162.429	0.000	-12947.868	0.006	1.100	0.004
TOTAL AIRCRAFT (INERTIAL AXIS)	0.005	0.000	0.055	0.006	1.100	0.004

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 52180.0, IYY = 21022.8, IZZ = 66612.8, DRIVEI = 824.0 SLUG-FT2

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 60.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.78 WLCG = 79.64 ***
*** MAST ANGLE = 30.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	0.0466	0.0000	-1.5959	0.0000	-0.1566	0.0000
	ROTOR	0.0000	0.5785	0.0000	-1.0204	0.0000	-0.2531	0.0000
	AIRFRM	0.0000	-0.5319	0.0000	-0.5755	0.0000	0.0965	0.0000
Q	TOTAL	-1.0502	0.0000	-4.1298	0.0000	-1.2285	0.0000	-0.7860
	ROTOR	-0.6226	0.0000	-1.1695	0.0000	0.0343	0.0000	-0.7860
	AIRFRM	-0.4276	0.0000	-2.9603	0.0000	-1.2628	0.0000	0.0000
R	TOTAL	0.0000	2.9153	0.0000	-0.1387	0.0000	-0.4979	0.0000
	ROTOR	0.0000	0.3127	0.0000	-0.3057	0.0000	-0.1082	0.0000
	AIRFRM	0.0000	2.6027	0.0000	0.1670	0.0000	-0.3897	0.0000
U	TOTAL	-0.2181	0.0000	-0.0333	0.0000	0.0082	0.0000	-0.1828
	ROTOR	-0.1237	0.0000	0.1437	0.0000	0.0080	0.0000	-0.1828
	AIRFRM	-0.0944	0.0000	-0.1770	0.0000	0.0002	0.0000	0.0000
V	TOTAL	0.0000	-0.2167	0.0000	-0.0054	0.0000	0.0092	0.0000
	ROTOR	0.0000	-0.0350	0.0000	-0.0021	0.0000	-0.0009	0.0000
	AIRFRM	0.0000	-0.1817	0.0000	-0.0033	0.0000	0.0101	0.0000
W	TOTAL	0.1637	0.0000	-1.1072	0.0000	-0.0198	0.0000	0.3329
	ROTOR	0.1850	0.0000	-0.3136	0.0000	-0.0064	0.0000	0.3329
	AIRFRM	-0.0213	0.0000	-0.7935	0.0000	-0.0134	0.0000	0.0000
RPM	TOTAL	0.7725	0.0000	-1.3711	0.0000	-0.0298	0.0000	2.8547
	ROTOR	0.7621	0.0000	-1.3989	0.0000	-0.0270	0.0000	2.8547
	AIRFRM	0.0103	0.0000	0.0278	0.0000	-0.0029	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.4646	0.0000	-4.4696	0.0000	-0.0730	0.0000	1.1604
	ROTOR	2.4478	0.0000	-4.5900	0.0000	-0.0643	0.0000	1.1604
	AIRFRM	0.0167	0.0000	0.1204	0.0000	-0.0087	0.0000	0.0000
XTHEG	TOTAL	2.0758	0.0000	-4.2738	0.0000	-0.0507	0.0000	5.8150
	ROTOR	2.0628	0.0000	-4.3913	0.0000	-0.0426	0.0000	5.8150
	AIRFRM	0.0130	0.0000	0.1175	0.0000	-0.0081	0.0000	0.0000
XLN	TOTAL	-0.6775	0.0000	0.9011	0.0000	-0.6506	0.0000	-2.6739
	ROTOR	-0.5060	0.0000	2.3365	0.0000	-0.0846	0.0000	-2.6739
	AIRFRM	-0.1715	0.0000	-1.4355	0.0000	-0.5660	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0793	0.0000	0.4440	0.0000	0.0857	0.0000
	ROTOR	0.0000	-0.0793	0.0000	0.2948	0.0000	0.0786	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1492	0.0000	0.0071	0.0000
XPD	TOTAL	0.0000	-1.0145	0.0000	-0.0819	0.0000	0.1442	0.0000
	ROTOR	0.0000	0.0591	0.0000	-0.0562	0.0000	-0.0027	0.0000
	AIRFRM	0.0000	-1.0737	0.0000	-0.0257	0.0000	0.1469	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL

CONFIGURATION:

NACELLE INCIDENCE	60.0 DEG	GEAR	0.0 % DOWN	ALTITUDE	
FLAP SETTING	20/12.5 DEG	STAB INCIDENCE	0.000 DEG	PRES(MSL)	0.0 FT
ROTOR RPM	589.0 RPM	INERTIA, SLUG-FT2		DENSITY	0.0 FT
GROSS WEIGHT	13000.0 LB	IXX 52180.	IXZ 1181.2	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	298.781 IN	IYY 21023.	IZZ 66613.	TEMP(OAT)	15.00 DEG-C
W.L.	79.638 IN	SIGMAP	1.00000 -ND-	VSOUND	661.48 KTS
		RHO	0.0023769 SLG/FT3	WIND-V	0.00 KTS

NOTE: SYMBOL INDICATES A TRIM PROBLEM

	U/VKCAS -KTS							
	80.00	100.00	120.00	140.00	0.00	0.00	0.00	0.00
	80.00	100.00	120.00	140.00	0.00	0.00	0.00	0.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	46.8177	60.3259	71.5826	79.3633	0.0000	0.0000	0.0000	0.0000
XLT,%	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000	0.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000	0.0000
XCOL,%	41.7286	48.1432	59.6863	77.3765	0.0000	0.0000	0.0000	0.0000
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	-0.3520	1.9952	3.9512	5.3031	0.0000	0.0000	0.0000	0.0000
THETO,DEG	42.1311	45.1215	48.7225	52.4033	0.0000	0.0000	0.0000	0.0000
THOG,DEG	-1.0843	1.1814	3.4780	5.1597	0.0000	0.0000	0.0000	0.0000
ELEVATOR,DEG	-1.4465	4.6937	9.8106	13.3474	0.0000	0.0000	0.0000	0.0000
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	1.8586	0.7458	0.3526	0.8564	0.0000	0.0000	0.0000	0.0000
LTFLP,DEG	2.7781	2.0952	1.9924	2.2962	0.0000	0.0000	0.0000	0.0000
THRUST,LB	3512.7	3296.8	3655.5	4389.8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CT	0.0051	0.0048	0.0053	0.0063	0.0000	0.0000	0.0000	0.0000
H-FORCE,LB	259.56	327.50	465.02	690.17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y-FORCE,LB	-3.0816	-79.557	-145.13	-195.45	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HORSEPOWER	494.68	603.37	816.79	1196.8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Q,FT-LB	4411.1	5380.2	7283.3	10672.	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CP	0.0005	0.0006	0.0008	0.0012	0.0000	0.0000	0.0000	0.0000
RPM,ROTOR	589.00	589.00	589.00	589.00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
WI,FT/SEC	10.6776	8.0926	7.5311	7.7847	0.0000	0.0000	0.0000	0.0000
MU	0.1643	0.1948	0.2230	0.2507	0.0000	0.0000	0.0000	0.0000
LAMDA	0.0745	0.1103	0.1486	0.1864	0.0000	0.0000	0.0000	0.0000
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	9.7166	2.8512	-1.9170	-5.1301	0.0000	0.0000	0.0000	0.0000
PITCH,DEG	9.7166	2.8512	-1.9170	-5.1301	0.0000	0.0000	0.0000	0.0000
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	21.6672	33.8550	48.7512	66.3558	0.0000	0.0000	0.0000	0.0000
MACH NUMBER	0.1209	0.1512	0.1814	0.2116	0.0000	0.0000	0.0000	0.0000
VT,KNOTS	80.0000	100.0000	120.0000	140.0000	0.0000	0.0000	0.0000	0.0000
VKCAS,KNOTS	80.0000	100.0002	119.9999	139.9999	0.0000	0.0000	0.0000	0.0000
HP-ENG	541.89	658.74	888.23	1296.8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0017 MIN TOTAL TIME USED IN THIS RUN = 0.3308 MIN

TIME: 22:35:23
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:35:23

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	60.0 degrees
Nacelle Incidence	=	30.0 degrees
Rotor Speed	=	589.0 RPM
Flap/Flaperon Position	=	20/12.5 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	100, 120, 140, 160 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =100.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	168.8	0.0000E+00	0.1907E-05
ACCEL	(FPS2)	0.9879E-05	0.3386E-06	0.7508E-04

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	166.5	0.9185E-06	27.40	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.5445E-05	-.1722E-02	0.5137E-05

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	100.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	33.86
ANGLE OF ATTACK	(DEG)	9.341
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	9.341
YAW ANGLE	(DEG)	0.000

----- INERTIAS -----
(SLUGS-FT2)

IXX	0.5157E+05
IXZ	1128.
IYY	0.2069E+05
IZZ	0.6689E+05

----- CENTER OF GRAVITY -----
(IN)

S.L.	297.7
B.L.	0.0000E+00
W.L.	76.69

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	4.2760	42.76
LONG	(FWD)	4.9869	51.95
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	515.5	4596.	-1.689	867.8	0.7773
RIGHT	515.5	4596.	-1.689	867.8	0.7773
ENGINE	564.2				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETA0	48.5350	48.5350
B1	0.9444	0.9444
A1	0.0000	0.0000

----------- ROTOR -----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.3263	1.4776	1.3866	1708.64	432.24	-95.71	15.47
RIGHT	1.3263	1.4776	1.3866	1708.64	432.24	-95.71	15.47

------- SURFACE POSITIONS -------
(DEG)

ELEVATOR	0.8850
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7530	0.1388	4.3185	0.1749	0.000530	0.002464	0.013696
RIGHT	0.7530	0.1388	4.3185	0.1749	0.000530	0.002464	0.013696

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01425	0.00867	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01425	0.00867				

TIME USED FOR THIS TRIM = 0.0112 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =100.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-39.401	0.000	-544.594	0.000	3562.967	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	237.345	0.000	-9374.362	0.006	3115.676	0.000
TOTAL	237.345	0.000	-9374.362	0.006	3115.676	0.000
ENGINE PYLONS	-464.273	0.000	-64.425	0.000	889.599	0.000
HORIZ. STAB.	-9.714	0.000	-346.224	0.000	-7546.788	0.000
VERT. STAB.						
FIN NO. 1	-4.348	0.000	0.000	0.000	14.133	-27.899
FIN NO. 2	-4.348	0.000	0.000	0.000	14.133	27.905
TOTAL	-8.697	0.000	0.000	-0.001	28.267	0.006
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	13.401	0.000	-7.737	124.436	-27.523	215.530
RIGHT ENG	13.401	0.000	-7.737	-124.436	-27.523	-215.530
TOTAL	26.802	0.000	-15.474	0.000	-55.045	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-257.938	0.000	-10345.079	0.005	-5.325	0.006
ROTOR						
LEFT ROTOR	1264.863	74.253	-1229.298	24013.414	-389.490	18158.260
RIGHT ROTOR	1264.863	-74.253	-1229.298	-24013.414	-389.490	-18158.260
HUB SPINNER	-161.691	0.000	-23.963	0.000	783.683	0.000
TOTAL ROTOR	2368.035	0.000	-2482.559	0.000	4.703	0.000
TOTAL AIRCRAFT (BODY AXIS)	2110.097	0.000	-12827.638	0.005	-0.622	0.006
TOTAL AIRCRAFT (INERTIAL AXIS)	0.009	0.000	-0.029	0.005	-0.622	0.006

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 51565.0, IYY = 20685.6, IZZ = 66890.6, DRIVEI = 824.0 SLUG-FT2

*** VT =100.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0001	0.6109	-0.0001	-0.7484	0.0000	-0.4357	0.0000
	ROTOR	0.0001	0.8783	0.0000	-0.4579	0.0000	-0.4092	0.0000
	AIRFRM	0.0000	-0.2674	0.0000	-0.2905	0.0000	-0.0265	0.0000
Q	TOTAL	-0.2497	0.0000	-4.4322	0.0000	-0.8931	0.0000	-0.0195
	ROTOR	-0.3748	0.0000	-2.1305	0.0000	0.1197	0.0000	-0.0195
	AIRFRM	0.1251	0.0000	-2.3017	0.0000	-1.0127	0.0000	0.0000
R	TOTAL	0.0000	2.9484	-0.0001	-0.3004	0.0000	-0.6425	0.0000
	ROTOR	0.0000	1.7048	0.0000	-0.4418	0.0000	-0.4536	0.0000
	AIRFRM	0.0000	1.2436	0.0000	0.1414	0.0000	-0.1888	0.0000
U	TOTAL	-0.3512	0.0000	-0.0727	0.0000	0.0208	0.0000	-0.3669
	ROTOR	-0.3235	0.0000	0.1633	0.0000	0.0151	0.0000	-0.3669
	AIRFRM	-0.0277	0.0000	-0.2361	0.0000	0.0057	0.0000	0.0000
V	TOTAL	0.0000	-0.1240	0.0000	-0.0028	0.0000	0.0049	0.0000
	ROTOR	0.0000	-0.0220	0.0000	-0.0002	0.0000	-0.0007	0.0000
	AIRFRM	0.0000	-0.1020	0.0000	-0.0026	0.0000	0.0056	0.0000
W	TOTAL	0.3167	0.0000	-0.6325	0.0000	-0.0345	0.0000	0.2275
	ROTOR	0.2143	0.0000	-0.1396	0.0000	-0.0070	0.0000	0.2275
	AIRFRM	0.1023	0.0000	-0.4930	0.0000	-0.0275	0.0000	0.0000
RPM	TOTAL	1.0085	0.0000	-0.5846	0.0000	-0.0416	0.0000	1.3924
	ROTOR	1.0120	0.0000	-0.6114	0.0000	-0.0399	0.0000	1.3924
	AIRFRM	-0.0034	0.0000	0.0268	0.0000	-0.0016	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.0372	0.0000	-1.1571	0.0000	-0.0813	0.0000	-0.9450
	ROTOR	2.0555	0.0000	-1.2364	0.0000	-0.0773	0.0000	-0.9450
	AIRFRM	-0.0183	0.0000	0.0793	0.0000	-0.0040	0.0000	0.0000
XTHEG	TOTAL	3.8566	0.0000	-2.4881	0.0000	-0.1360	0.0000	5.0507
	ROTOR	3.8949	0.0000	-2.6460	0.0000	-0.1281	0.0000	5.0507
	AIRFRM	-0.0383	0.0000	0.1580	0.0000	-0.0079	0.0000	0.0000
XLN	TOTAL	-0.6174	0.0000	-0.3452	0.0000	-0.3734	0.0000	-1.0015
	ROTOR	-0.6390	0.0000	0.5370	0.0000	-0.0093	0.0000	-1.0015
	AIRFRM	0.0216	0.0000	-0.8822	0.0000	-0.3641	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0099	0.0000	0.2134	0.0000	0.1313	0.0000
	ROTOR	0.0000	-0.0099	0.0000	0.1344	0.0000	0.1281	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.0790	0.0000	0.0032	0.0000
XPD	TOTAL	0.0000	-0.8097	0.0000	-0.0362	0.0000	0.1023	0.0000
	ROTOR	0.0000	0.0124	0.0000	-0.0150	0.0000	-0.0101	0.0000
	AIRFRM	0.0000	-0.8220	0.0000	-0.0211	0.0000	0.1125	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =120.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	202.5	0.3553E-14	0.9537E-06
ACCEL	(FPS2)	-.9570E-05	-.3181E-06	-.1456E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	202.3	0.4619E-07	9.919	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.1607E-05	0.3430E-02	0.3713E-05

ATMOSPHERIC CONDITIONS		FLIGHT PATH CONDITIONS			INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
ALTITUDE (FT)	5000.00	CAL. AIRSPEED (KNOTS)	120.01					
DENSITY ALT. (FT)	0.00	RATE OF DECENT (FPS)	0.00					
PRESSURE ALT. (FT)	0.00	G-LEVEL (G S)	1.00	IXX	0.5157E+05		S.L.	297.7
AMBIENT TEMP (DEG-R)	288.16	DYN PRES (SLUGS/FT-SEC2)	48.75	IXZ	1128.		B.L.	0.0000E+00
OUTSIDE AIR TEMP (DEG-C)	15.00	ANGLE OF ATTACK (DEG)	2.807	IYY	0.2069E+05		W.L.	76.69
AIR DENSITY (SLUGS/FT3)	0.2377E-02	FLIGHT PATH ANGLE (DEG)	0.000	IZZ	0.6689E+05			
		SIDESLIP ANGLE (DEG)	0.000					
THETES (ND)	1.00000	ROLL ANGLE (DEG)	0.000					
DELSTD (ND)	1.00000	PITCH ANGLE (DEG)	2.807					
SIGMA PRIME (ND)	1.00000	YAW ANGLE (DEG)	0.000					

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	4.6655	46.65
LONG	(FWD)	6.1252	63.80
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	586.3	5228.	1.948	889.7	0.7969
RIGHT	586.3	5228.	1.948	889.7	0.7969
ENGINE	640.4				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	52.3737	52.3737
B1	2.1282	2.1282
A1	0.0000	0.0000

ROTOR FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.3092	1.0649	1.1602	1654.12	565.31	-130.76	9.83
RIGHT	1.3092	1.0649	1.1602	1654.12	565.31	-130.76	9.83

SURFACE POSITIONS (DEG)	
ELEVATOR	6.2750
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7233	0.1423	3.5279	0.2253	0.000603	0.002385	0.013722
RIGHT	0.7233	0.1423	3.5279	0.2253	0.000603	0.002385	0.013722

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01033	0.00853	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01033	0.00853				

TIME USED FOR THIS TRIM = 0.0300 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-109.528	0.000	-482.262	0.000	-386.488	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-669.167	0.000	-9532.340	0.000	3944.824	0.000
TOTAL	-669.167	0.000	-9532.340	0.000	3944.824	0.000
ENGINE PYLONS	-663.560	0.000	-22.729	0.000	1284.790	0.000
HORIZ. STAB.	-37.828	0.000	-294.726	0.000	-6359.454	0.000
VERT. STAB.						
FIN NO. 1	-9.653	0.000	0.000	0.000	31.375	-61.938
FIN NO. 2	-9.653	0.000	0.000	0.000	31.375	61.942
TOTAL	-19.306	0.000	0.000	-0.001	62.750	0.004
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	8.511	0.000	-4.914	79.031	-17.480	136.886
RIGHT ENG	8.511	0.000	-4.914	-79.031	-17.480	-136.886
TOTAL	17.022	0.000	-9.828	0.000	-34.960	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1482.367	0.000	-10341.885	-0.001	-1488.538	0.004
ROTOR						
LEFT ROTOR	1151.657	107.760	-1317.569	26156.285	336.736	16187.085
RIGHT ROTOR	1151.657	-107.760	-1317.569	-26156.283	336.736	-16187.085
HUB SPINNER	-184.302	0.000	-7.319	0.000	816.305	0.000
TOTAL ROTOR	2119.011	0.000	-2642.458	0.002	1489.777	0.000
TOTAL AIRCRAFT (BODY AXIS)	636.644	0.000	-12984.343	0.001	1.238	0.004
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.007	0.000	0.059	0.001	1.238	0.004

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 51565.0, IYY = 20685.6, IZZ = 66890.6, DRIVEI = 824.0 SLUG-FT2

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0001	0.6118	0.0000	-0.9195	0.0000	-0.3965	0.0001
	ROTOR	0.0001	1.1045	0.0000	-0.5080	0.0000	-0.4216	0.0001
	AIRFRM	0.0000	-0.4927	0.0000	-0.4114	0.0000	0.0251	0.0000
Q	TOTAL	-0.7696	0.0000	-5.4049	0.0000	-1.0122	0.0000	-0.4510
	ROTOR	-0.6558	0.0000	-2.7215	0.0000	0.1869	0.0000	-0.4510
	AIRFRM	-0.1138	0.0000	-2.6834	0.0000	-1.1991	0.0000	0.0000
R	TOTAL	0.0000	4.4750	0.0000	-0.2802	0.0000	-0.7862	0.0000
	ROTOR	0.0000	2.1744	0.0000	-0.4479	0.0000	-0.4457	0.0000
	AIRFRM	0.0000	2.3006	0.0000	0.1677	0.0000	-0.3404	0.0000
U	TOTAL	-0.3818	0.0000	-0.0820	0.0000	0.0187	0.0000	-0.5065
	ROTOR	-0.3380	0.0000	0.1597	0.0000	0.0167	0.0000	-0.5065
	AIRFRM	-0.0438	0.0000	-0.2417	0.0000	0.0020	0.0000	0.0000
V	TOTAL	0.0000	-0.1866	0.0000	-0.0043	0.0000	0.0091	0.0000
	ROTOR	0.0000	-0.0309	0.0000	-0.0006	0.0000	-0.0012	0.0000
	AIRFRM	0.0000	-0.1557	0.0000	-0.0037	0.0000	0.0102	0.0000
W	TOTAL	0.2929	0.0000	-0.7754	0.0000	-0.0250	0.0000	0.2997
	ROTOR	0.2138	0.0000	-0.1432	0.0000	-0.0066	0.0000	0.2997
	AIRFRM	0.0791	0.0000	-0.6321	0.0000	-0.0185	0.0000	0.0000
RPM	TOTAL	1.2864	0.0000	-0.6863	0.0000	-0.0572	0.0000	2.2031
	ROTOR	1.2887	0.0000	-0.7537	0.0000	-0.0527	0.0000	2.2031
	AIRFRM	-0.0023	0.0000	0.0674	0.0000	-0.0045	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.1981	0.0000	-1.1385	0.0000	-0.0957	0.0000	-0.2105
	ROTOR	2.2114	0.0000	-1.2895	0.0000	-0.0865	0.0000	-0.2105
	AIRFRM	-0.0133	0.0000	0.1509	0.0000	-0.0093	0.0000	0.0000
XTHEG	TOTAL	4.1822	0.0000	-2.5412	0.0000	-0.1587	0.0000	6.8983
	ROTOR	4.2125	0.0000	-2.8467	0.0000	-0.1402	0.0000	6.8983
	AIRFRM	-0.0302	0.0000	0.3055	0.0000	-0.0185	0.0000	0.0000
XLN	TOTAL	-0.6992	0.0000	-0.7013	0.0000	-0.5320	0.0000	-1.3191
	ROTOR	-0.6357	0.0000	0.5800	0.0000	-0.0135	0.0000	-1.3191
	AIRFRM	-0.0636	0.0000	-1.2814	0.0000	-0.5186	0.0000	0.0000
XLT	TOTAL	0.0000	0.0085	0.0000	0.2686	0.0000	0.1399	0.0000
	ROTOR	0.0000	0.0085	0.0000	0.1512	0.0000	0.1371	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1174	0.0000	0.0027	0.0000
XPD	TOTAL	0.0000	-1.1690	0.0000	-0.0472	0.0000	0.1524	0.0000
	ROTOR	0.0000	0.0148	0.0000	-0.0169	0.0000	-0.0096	0.0000
	AIRFRM	0.0000	-1.1837	0.0000	-0.0304	0.0000	0.1620	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	236.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.2568E-04	0.9194E-07	-.8657E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	236.3	-.4747E-07	-3.186	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.3827E-05	0.7728E-02	0.1326E-05

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	140.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	66.36
ANGLE OF ATTACK	(DEG)	-0.773
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-0.773
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5157E+05
IXZ	1128.
IYY	0.2069E+05
IZZ	0.6689E+05

CENTER OF GRAVITY (IN)

S.L.	297.7
B.L.	0.0000E+00
W.L.	76.69

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	5.3861	53.86
LONG	(FWD)	6.7790	70.61
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	721.8	6436.	5.041	912.4	0.8172
RIGHT	721.8	6436.	5.041	912.4	0.8172
ENGINE	786.0				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETAO	55.8415	55.8415
B1	2.8082	2.8082
A1	0.0000	0.0000

ROTOR — FLAPPING — FORCES - MAST AXIS — JET

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.3699	1.1836	1.2104	1847.56	727.94	-165.25	7.27
RIGHT	1.3699	1.1836	1.2104	1847.56	727.94	-165.25	7.27

SURFACE POSITIONS (DEG)

ELEVATOR	9.3707
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7371	0.1496	3.3978	0.2718	0.000742	0.002664	0.013664
RIGHT	0.7371	0.1496	3.3978	0.2718	0.000742	0.002664	0.013664

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00624	0.00825	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00624	0.00825				

TIME USED FOR THIS TRIM = 0.0193 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-178.774	0.000	-430.988	0.000	-5109.172	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1295.226	0.000	-9315.258	0.004	3994.160	0.000
TOTAL	-1295.226	0.000	-9315.258	0.004	3994.160	0.000
ENGINE PYLONS	-897.453	0.000	21.989	0.000	1747.792	0.000
HORIZ. STAB.	-46.074	0.000	-160.634	0.000	-3410.256	0.000
VERT. STAB.						
FIN NO. 1	-13.579	0.000	0.000	0.000	44.136	-87.131
FIN NO. 2	-13.579	0.000	0.000	0.000	44.136	87.133
TOTAL	-27.158	0.000	0.000	0.000	88.271	0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	6.300	0.000	-3.637	58.499	-12.939	101.324
RIGHT ENG	6.300	0.000	-3.637	-58.499	-12.939	-101.324
TOTAL	12.600	0.000	-7.275	0.000	-25.878	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2432.085	0.000	-9892.166	0.003	-2715.082	0.001
ROTOR						
LEFT ROTOR	1238.372	138.102	-1555.398	31170.746	897.303	17091.578
RIGHT ROTOR	1238.372	-138.102	-1555.398	-31170.746	897.303	-17091.578
HUB SPINNER	-219.940	0.000	4.491	0.000	923.238	0.000
TOTAL ROTOR	2256.804	0.000	-3106.305	0.000	2717.845	0.000
TOTAL AIRCRAFT (BODY AXIS)	-175.281	0.000	-12998.471	0.003	2.763	0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.002	0.000	0.347	0.003	2.763	0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 51565.0, IYY = 20685.6, IZZ = 66890.6, DRIVEI = 824.0 SLUG-FT2

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	0.6940	0.0000	-1.0566	0.0000	-0.3748	0.0000
	ROTOR	0.0000	1.2911	0.0000	-0.5694	0.0000	-0.4350	0.0000
	AIRFRM	0.0000	-0.5971	0.0000	-0.4872	0.0000	0.0602	0.0000
Q	TOTAL	-1.2298	0.0000	-6.2769	0.0000	-1.1453	0.0000	-0.5070
	ROTOR	-0.9324	0.0000	-3.2114	0.0000	0.2459	0.0000	-0.5070
	AIRFRM	-0.2974	0.0000	-3.0656	0.0000	-1.3911	0.0000	0.0000
R	TOTAL	0.0001	5.3588	-0.0001	-0.2684	0.0000	-0.8396	0.0003
	ROTOR	0.0001	2.5700	-0.0001	-0.4531	0.0000	-0.4268	0.0003
	AIRFRM	0.0000	2.7888	0.0000	0.1847	0.0000	-0.4128	0.0000
U	TOTAL	-0.4029	0.0000	-0.0922	0.0000	0.0191	0.0000	-0.6303
	ROTOR	-0.3462	0.0000	0.1562	0.0000	0.0177	0.0000	-0.6303
	AIRFRM	-0.0567	0.0000	-0.2484	0.0000	0.0015	0.0000	0.0000
V	TOTAL	0.0000	-0.2258	0.0000	-0.0054	0.0000	0.0103	0.0000
	ROTOR	0.0000	-0.0401	0.0000	-0.0010	0.0000	-0.0016	0.0000
	AIRFRM	0.0000	-0.1857	0.0000	-0.0044	0.0000	0.0119	0.0000
W	TOTAL	0.2209	0.0000	-0.8742	0.0000	-0.0241	0.0000	0.3764
	ROTOR	0.2170	0.0000	-0.1509	0.0000	-0.0062	0.0000	0.3764
	AIRFRM	0.0039	0.0000	-0.7233	0.0000	-0.0180	0.0000	0.0000
RPM	TOTAL	1.5807	0.0000	-0.7829	0.0000	-0.0737	0.0000	3.1987
	ROTOR	1.5725	0.0000	-0.9106	0.0000	-0.0650	0.0000	3.1987
	AIRFRM	0.0081	0.0000	0.1276	0.0000	-0.0086	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.3801	0.0000	-1.1469	0.0000	-0.1084	0.0000	0.5867
	ROTOR	2.3725	0.0000	-1.3704	0.0000	-0.0939	0.0000	0.5867
	AIRFRM	0.0076	0.0000	0.2235	0.0000	-0.0145	0.0000	0.0000
XTHEG	TOTAL	4.4966	0.0000	-2.6282	0.0000	-0.1752	0.0000	8.8837
	ROTOR	4.4859	0.0000	-3.0829	0.0000	-0.1460	0.0000	8.8837
	AIRFRM	0.0107	0.0000	0.4546	0.0000	-0.0292	0.0000	0.0000
XLN	TOTAL	-0.7721	0.0000	-0.9383	0.0000	-0.6525	0.0000	-1.6874
	ROTOR	-0.6396	0.0000	0.6486	0.0000	-0.0191	0.0000	-1.6874
	AIRFRM	-0.1325	0.0000	-1.5869	0.0000	-0.6334	0.0000	0.0000
XLT	TOTAL	0.0000	0.0199	0.0000	0.3246	0.0000	0.1458	0.0000
	ROTOR	0.0000	0.0199	0.0000	0.1662	0.0000	0.1413	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1583	0.0000	0.0045	0.0000
XPD	TOTAL	0.0000	-1.1094	0.0000	-0.0484	0.0000	0.1450	0.0000
	ROTOR	0.0000	0.0180	0.0000	-0.0194	0.0000	-0.0092	0.0000
	AIRFRM	0.0000	-1.1273	0.0000	-0.0290	0.0000	0.1542	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
*** GW = 13000.0 RPM = 589.00 SLCG = 297.69 WLCG = 76.69 ***
*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	270.0	0.0000E+00	0.9537E-06
ACCEL	(FPS2)	0.1111E-03	0.8298E-07	-.1207E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	269.6	-.4274E-06	-14.80	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.4469E-05	0.2516E-02	0.4336E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		160.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		86.67
ANGLE OF ATTACK (DEG)		-3.143
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-3.143
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5157E+05	S.L.	297.7
IXZ	1128.	B.L.	0.0000E+00
IYY	0.2069E+05	W.L.	76.69
IZZ	0.6689E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	6.2957	62.96
LONG	(FWD)	7.0936	73.89
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	901.8	8041.	7.759	935.7	0.8381
RIGHT	901.8	8041.	7.759	935.7	0.8381
ENGINE	979.6				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	59.0325	59.0325
B1	3.1353	3.1353
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	10.8600
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.4579	1.6955	1.4158	2127.38	925.76	-197.12	6.07
RIGHT	1.4579	1.6955	1.4158	2127.38	925.76	-197.12	6.07

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7526	0.1582	3.4358	0.3169	0.000928	0.003067	0.013604
RIGHT	0.7526	0.1582	3.4358	0.3169	0.000928	0.003067	0.013604

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00202	0.00792	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00202	0.00792				

TIME USED FOR THIS TRIM = 0.0200 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
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*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-258.695	0.000	-366.490	0.000	-10637.519	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1726.646	0.000	-8983.600	0.005	3542.315	0.000
TOTAL	-1726.646	0.000	-8983.600	0.005	3542.315	0.000
ENGINE PYLONS	-1165.703	0.000	74.569	0.000	2279.056	0.000
HORIZ. STAB.	-38.667	0.000	18.928	0.000	498.536	0.000
VERT. STAB.						
FIN NO. 1	-17.114	0.000	0.000	0.000	55.624	-109.809
FIN NO. 2	-17.114	0.000	0.000	0.000	55.624	109.815
TOTAL	-34.227	0.000	0.000	-0.001	111.248	0.006
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	5.260	0.000	-3.037	48.845	-10.804	84.603
RIGHT ENG	5.260	0.000	-3.037	-48.845	-10.804	-84.603
TOTAL	10.521	0.000	-6.074	0.000	-21.607	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-3213.418	0.000	-9262.667	0.004	-4227.970	0.005
ROTOR						
LEFT ROTOR	1382.255	164.533	-1866.861	37685.680	1581.305	18674.557
RIGHT ROTOR	1382.255	-164.533	-1866.861	-37685.680	1581.305	-18674.557
HUB SPINNER	-263.733	0.000	15.984	0.000	1066.268	0.000
TOTAL ROTOR	2500.778	0.000	-3717.738	0.000	4228.878	0.000
TOTAL AIRCRAFT (BODY AXIS)	-712.640	0.000	-12980.404	0.004	0.908	0.005
TOTAL AIRCRAFT (INERTIAL AXIS)	0.047	0.000	0.046	0.004	0.908	0.005

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 51565.0, IYY = 20685.6, IZZ = 66890.6, DRIVEI = 824.0 SLUG-FT2

*** VT =160.00 KTS *** NACELLE INCIDENCE = 30.0 DEG *** CONVERSION ***
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*** MAST ANGLE = 60.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0001	0.8008	-0.0001	-1.1923	0.0000	-0.3578	0.0000
	ROTOR	0.0001	1.4686	-0.0001	-0.6375	0.0000	-0.4460	0.0000
	AIRFRM	0.0000	-0.6678	0.0000	-0.5548	0.0000	0.0882	0.0000
Q	TOTAL	-1.5773	0.0000	-7.0570	0.0000	-1.3103	0.0000	-0.3268
	ROTOR	-1.2340	0.0000	-3.6668	0.0000	0.3043	0.0000	-0.3268
	AIRFRM	-0.3433	0.0000	-3.3903	0.0000	-1.6146	0.0000	0.0000
R	TOTAL	0.0000	6.0628	0.0000	-0.2560	0.0000	-0.8634	0.0000
	ROTOR	0.0000	2.9451	0.0000	-0.4556	0.0000	-0.4003	0.0000
	AIRFRM	0.0000	3.1177	0.0000	0.1996	0.0000	-0.4632	0.0000
U	TOTAL	-0.4190	0.0000	-0.1067	0.0000	0.0196	0.0000	-0.7426
	ROTOR	-0.3480	0.0000	0.1518	0.0000	0.0182	0.0000	-0.7426
	AIRFRM	-0.0710	0.0000	-0.2584	0.0000	0.0014	0.0000	0.0000
V	TOTAL	0.0000	-0.2586	0.0000	-0.0063	0.0000	0.0108	0.0000
	ROTOR	0.0000	-0.0496	0.0000	-0.0013	0.0000	-0.0020	0.0000
	AIRFRM	0.0000	-0.2090	0.0000	-0.0050	0.0000	0.0127	0.0000
W	TOTAL	0.2041	0.0000	-1.0341	0.0000	-0.0256	0.0000	0.4404
	ROTOR	0.2205	0.0000	-0.1609	0.0000	-0.0056	0.0000	0.4404
	AIRFRM	-0.0164	0.0000	-0.8732	0.0000	-0.0200	0.0000	0.0000
RPM	TOTAL	1.8675	0.0000	-0.8752	0.0000	-0.0894	0.0000	4.3859
	ROTOR	1.8381	0.0000	-1.0744	0.0000	-0.0754	0.0000	4.3859
	AIRFRM	0.0295	0.0000	0.1992	0.0000	-0.0140	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	2.5581	0.0000	-1.1904	0.0000	-0.1182	0.0000	1.4861
	ROTOR	2.5208	0.0000	-1.4648	0.0000	-0.0992	0.0000	1.4861
	AIRFRM	0.0373	0.0000	0.2744	0.0000	-0.0190	0.0000	0.0000
XTHEG	TOTAL	4.8010	0.0000	-2.7975	0.0000	-0.1849	0.0000	11.0367
	ROTOR	4.7306	0.0000	-3.3602	0.0000	-0.1463	0.0000	11.0367
	AIRFRM	0.0703	0.0000	0.5627	0.0000	-0.0386	0.0000	0.0000
XLN	TOTAL	-0.8559	0.0000	-1.3528	0.0000	-0.8575	0.0000	-2.1196
	ROTOR	-0.6470	0.0000	0.7298	0.0000	-0.0254	0.0000	-2.1196
	AIRFRM	-0.2089	0.0000	-2.0826	0.0000	-0.8321	0.0000	0.0000
XLT	TOTAL	0.0000	0.0281	0.0000	0.3918	0.0000	0.1535	0.0000
	ROTOR	0.0000	0.0281	0.0000	0.1857	0.0000	0.1468	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2062	0.0000	0.0067	0.0000
XPD	TOTAL	0.0000	-1.4431	0.0000	-0.0600	0.0000	0.1917	0.0000
	ROTOR	0.0000	0.0216	0.0000	-0.0224	0.0000	-0.0087	0.0000
	AIRFRM	0.0000	-1.4646	0.0000	-0.0376	0.0000	0.2004	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL

CONFIGURATION:

NACELLE INCIDENCE	30.0 DEG	GEAR	0.0 % DOWN	ALTITUDE	
FLAP SETTING	20/12.5 DEG	STAB INCIDENCE	0.000 DEG	PRES(MSL)	0.0 FT
ROTOR RPM	589.0 RPM	INERTIA, SLUG-FT2		DENSITY	0.0 FT
GROSS WEIGHT	13000.0 LB	IXX 51565.	IXZ 1128.4	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	297.693 IN	IYY 20686.	IZZ 66891.	TEMP(OAT)	15.00 DEG-C
W.L.	76.687 IN	SIGMAP 1.00000 -ND-		VSOUND	661.48 KTS
		RHO 0.0023769 SLG/FT3		WIND-V	0.00 KTS

U/VKCAS -KTS

NOTE: SYMBOL INDICATES A TRIM PROBLEM

	100.00	120.00	140.00	160.00	0.00	0.00	0.00	0.00
	100.00	120.00	140.00	160.00	0.00	0.00	0.00	0.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	51.9469	63.8045	70.6150	73.8912	0.0000	0.0000	0.0000	0.0000
XLT,%	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000	0.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000	0.0000
XCOL,%	42.7598	46.6550	53.8608	62.9574	0.0000	0.0000	0.0000	0.0000
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	0.9444	2.1282	2.8082	3.1353	0.0000	0.0000	0.0000	0.0000
THETO,DEG	48.5350	52.3737	55.8415	59.0325	0.0000	0.0000	0.0000	0.0000
THOG,DEG	-1.6885	1.9477	5.0407	7.7587	0.0000	0.0000	0.0000	0.0000
ELEVATOR,DEG	0.8850	6.2750	9.3707	10.8600	0.0000	0.0000	0.0000	0.0000
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	1.4776	1.0649	1.1836	1.6955	0.0000	0.0000	0.0000	0.0000
LTFLP,DEG	1.3866	1.1602	1.2104	1.4158	0.0000	0.0000	0.0000	0.0000
THRUST,LB	1708.6	1654.1	1847.6	2127.4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CT	0.0025	0.0024	0.0027	0.0031	0.0000	0.0000	0.0000	0.0000
H-FORCE,LB	432.24	565.31	727.94	925.76	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y-FORCE,LB	-95.711	-130.76	-165.25	-197.12	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HORSEPOWER	515.46	586.32	721.77	901.80	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Q,FT-LB	4596.4	5228.3	6436.0	8041.4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CP	0.0005	0.0006	0.0007	0.0009	0.0000	0.0000	0.0000	0.0000
RPM,ROTOR	589.00	589.00	589.00	589.00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
WI,FT/SEC	4.3185	3.5279	3.3978	3.4358	0.0000	0.0000	0.0000	0.0000
MU	0.1388	0.1423	0.1496	0.1582	0.0000	0.0000	0.0000	0.0000
LAMDA	0.1749	0.2253	0.2718	0.3169	0.0000	0.0000	0.0000	0.0000
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	9.3413	2.8071	-0.7726	-3.1427	0.0000	0.0000	0.0000	0.0000
PITCH,DEG	9.3413	2.8071	-0.7726	-3.1427	0.0000	0.0000	0.0000	0.0000
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	33.8550	48.7512	66.3558	86.6688	0.0000	0.0000	0.0000	0.0000
MACH NUMBER	0.1512	0.1814	0.2116	0.2419	0.0000	0.0000	0.0000	0.0000
VT,KNOTS	100.0000	120.0000	140.0000	160.0000	0.0000	0.0000	0.0000	0.0000
VKCAS,KNOTS	100.0002	119.9999	139.9999	160.0000	0.0000	0.0000	0.0000	0.0000
HP-ENG	564.22	640.42	786.03	979.62	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0017 MIN TOTAL TIME USED IN THIS RUN = 0.3278 MIN

TIME: 22:40:07
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:40:07

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	90.0 degrees
Nacelle Incidence	=	0.0 degrees
Rotor Speed	=	589.0 RPM
Flap/Flaperon Position	=	20/12.5 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	120, 140, 160, 180 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	202.5	0.0000E+00	-.1907E-05
ACCEL	(FPS2)	0.9256E-04	0.5719E-07	0.5762E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	201.6	0.1815E-07	19.49	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.3871E-08	-.1362E-01	-.3316E-08

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		120.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		48.75
ANGLE OF ATTACK (DEG)		5.523
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		5.523
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	3.8202	38.20
LONG	(FWD)	5.0814	52.93
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	455.4	4060.	-1.139	797.2	0.7140
RIGHT	455.4	4060.	-1.139	797.2	0.7140
ENGINE	499.6				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	54.6611	54.6611
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	1.3323
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.0255	-0.9180	-0.1398	751.00	72.05	-37.60	2.05
RIGHT	1.0255	-0.9180	-0.1398	751.00	72.05	-37.60	2.05

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6078	0.0253	1.6440	0.2636	0.000468	0.001083	0.014207
RIGHT	0.6078	0.0253	1.6440	0.2636	0.000468	0.001083	0.014207

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02706	0.01416	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02706	0.01416				

TIME USED FOR THIS TRIM = 0.0103 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-87.736	0.000	-607.386	0.000	2214.048	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	19.889	0.000	-12099.477	0.000	2005.868	0.000
TOTAL	19.889	0.000	-12099.477	0.000	2005.868	0.000
ENGINE PYLONS	-49.794	0.000	-4.752	0.000	108.901	0.000
HORIZ. STAB.	-23.230	0.000	-74.700	0.000	-1572.600	0.000
VERT. STAB.						
FIN NO. 1	-8.032	0.000	0.000	0.000	28.181	-51.538
FIN NO. 2	-8.032	0.000	0.000	0.000	28.181	51.538
TOTAL	-16.064	0.000	0.000	0.000	56.363	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	2.048	0.000	0.000	0.000	-4.509	32.943
RIGHT ENG	2.048	0.000	0.000	0.000	-4.509	-32.943
TOTAL	4.097	0.000	0.000	0.000	-9.017	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-152.837	0.000	-12786.315	0.000	2803.563	0.000
ROTOR						
LEFT ROTOR	751.540	36.336	-72.034	5304.831	-1534.748	12347.720
RIGHT ROTOR	751.540	-36.336	-72.034	-5304.831	-1534.748	-12347.720
HUB SPINNER	-99.104	0.000	-9.504	0.000	261.095	0.000
TOTAL ROTOR	1403.976	0.000	-153.573	0.000	-2808.400	0.000
TOTAL AIRCRAFT (BODY AXIS)	1251.139	0.000	-12939.889	0.000	-4.837	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.060	0.000	-0.228	0.000	-4.837	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =120.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.5860	0.0000	-0.4080	0.0000	-0.1518	0.0000
	ROTOR	0.0000	-0.1538	0.0000	-0.1026	0.0000	-0.1605	0.0000
	AIRFRM	0.0000	-0.4323	0.0000	-0.3054	0.0000	0.0087	0.0000
Q	TOTAL	0.9528	0.0000	-5.9833	0.0000	-0.9825	0.0000	0.3336
	ROTOR	1.0340	0.0000	-3.4036	0.0000	0.1797	0.0000	0.3336
	AIRFRM	-0.0812	0.0000	-2.5797	0.0000	-1.1622	0.0000	0.0000
R	TOTAL	-0.0002	5.2769	0.0000	0.0469	0.0000	-0.9099	-0.0001
	ROTOR	-0.0002	3.3663	0.0000	-0.1494	0.0000	-0.6285	-0.0001
	AIRFRM	0.0000	1.9105	0.0000	0.1964	0.0000	-0.2813	0.0000
U	TOTAL	-0.4485	0.0000	-0.3022	0.0000	0.0255	0.0000	-0.6527
	ROTOR	-0.4310	0.0000	-0.0111	0.0000	0.0198	0.0000	-0.6527
	AIRFRM	-0.0175	0.0000	-0.2911	0.0000	0.0057	0.0000	0.0000
V	TOTAL	0.0000	-0.1689	0.0000	-0.0060	0.0000	0.0070	0.0000
	ROTOR	0.0000	-0.0317	0.0000	0.0000	0.0000	-0.0015	0.0000
	AIRFRM	0.0000	-0.1373	0.0000	-0.0060	0.0000	0.0085	0.0000
W	TOTAL	0.1187	0.0000	-0.5830	0.0000	-0.0185	0.0000	-0.0050
	ROTOR	0.0033	0.0000	-0.0320	0.0000	0.0035	0.0000	-0.0050
	AIRFRM	0.1154	0.0000	-0.5510	0.0000	-0.0220	0.0000	0.0000
RPM	TOTAL	1.5609	0.0000	0.1350	0.0000	-0.0775	0.0000	2.5699
	ROTOR	1.5591	0.0000	0.0328	0.0000	-0.0713	0.0000	2.5699
	AIRFRM	0.0019	0.0000	0.1023	0.0000	-0.0063	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9515
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9515
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	4.7417	0.0000	0.3747	0.0000	-0.2311	0.0000	7.5116
	ROTOR	4.7515	0.0000	0.0374	0.0000	-0.2110	0.0000	7.5116
	AIRFRM	-0.0098	0.0000	0.3373	0.0000	-0.0200	0.0000	0.0000
XLN	TOTAL	-0.0136	0.0000	-1.1719	0.0000	-0.5070	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0136	0.0000	-1.1719	0.0000	-0.5070	0.0000	0.0000
XLT	TOTAL	0.0000	0.0059	0.0000	0.1388	0.0000	0.0489	0.0000
	ROTOR	0.0000	0.0059	0.0000	0.0133	0.0000	0.0561	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1255	0.0000	-0.0072	0.0000
XPD	TOTAL	0.0000	-1.1274	0.0000	-0.0314	0.0000	0.1536	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.1274	0.0000	-0.0314	0.0000	0.1536	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****

*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

****

		----- EARTH REFERENCE ----- UE	VE	WE
RATE	(FPS)	236.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.3904E-03	0.9835E-07	-.2989E-02

	---------- BODY REFERENCE ---------- UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	236.2	0.7457E-07	6.673	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.7139E-06	0.4449E-01	0.1996E-05

----- ATMOSPHERIC CONDITIONS -----	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----		
CAL. AIRSPEED (KNOTS)		140.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		66.36
ANGLE OF ATTACK (DEG)		1.618
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	1.618
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)		----- CENTER OF GRAVITY ----- (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

----- CONTROL DISPLACEMENTS -----	(+)	(IN)	(PER)
COLL	(UP)	4.1844	41.84
LONG	(FWD)	5.7522	59.92
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ----------	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	---------- BLADE ---------- TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	515.9	4601.	1.938	806.4	0.7223
RIGHT	515.9	4601.	1.938	806.4	0.7223
ENGINE	564.7				

----- SWASH PLATE ANGLE (DEG) ----	LEFT ROTOR	RIGHT ROTOR
THETA0	57.7375	57.7375
B1	1.5000	1.5000
A1	0.0000	0.0000

------- SURFACE POSITIONS ------- (DEG)	
ELEVATOR	4.5086
AILERON	0.0000
RUDDER	0.0000

---------- ROTOR ---------- ---------- FLAPPING ----------	A0 (DEG)	LONG (DEG)	LAT (DEG)	---- FORCES - MAST AXIS ------ THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	1.0244	-1.3777	-0.3392	747.54	-13.95	-28.91	-4.21
RIGHT	1.0244	-1.3777	-0.3392	747.54	-13.95	-28.91	-4.21

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6228	0.0087	1.3977	0.3081	0.000531	0.001078	0.014198
RIGHT	0.6228	0.0087	1.3977	0.3081	0.000531	0.001078	0.014198

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02540	0.01539	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02540	0.01539				

TIME USED FOR THIS TRIM = 0.0183 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-159.951	0.000	-581.677	0.000	-1980.378	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-711.242	0.000	-12598.629	0.000	1824.453	0.000
TOTAL	-711.242	0.000	-12598.629	0.000	1824.453	0.000
ENGINE PYLONS	-67.591	0.000	-1.892	0.000	148.499	0.000
HORIZ. STAB.	-24.125	0.000	164.477	0.000	3647.110	0.000
VERT. STAB.						
FIN NO. 1	-11.529	0.000	0.000	0.000	40.453	-73.980
FIN NO. 2	-11.529	0.000	0.000	0.000	40.453	73.982
TOTAL	-23.059	0.000	0.000	0.000	80.906	0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-4.210	0.000	0.000	0.000	9.267	-67.711
RIGHT ENG	-4.210	0.000	0.000	0.000	9.267	67.711
TOTAL	-8.420	0.000	0.000	0.000	18.534	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-994.388	0.000	-13017.722	0.000	3739.123	0.002
ROTOR						
LEFT ROTOR	747.935	29.149	13.944	4439.479	-2017.933	12303.634
RIGHT ROTOR	747.935	-29.149	13.944	-4439.478	-2017.933	-12303.634
HUB SPINNER	-134.249	0.000	-3.770	0.000	312.542	0.000
TOTAL ROTOR	1361.620	0.000	24.119	0.001	-3723.324	0.000
TOTAL AIRCRAFT (BODY AXIS)	367.232	0.000	-12993.604	0.001	15.799	0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	0.124	0.000	1.211	0.001	15.799	0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6983	0.0000	-0.5983	0.0000	-0.1398	0.0000
	ROTOR	0.0000	-0.1644	0.0000	-0.1236	0.0000	-0.1757	0.0000
	AIRFRM	0.0000	-0.5340	0.0000	-0.4748	0.0000	0.0359	0.0000
Q	TOTAL	0.9144	0.0000	-7.0060	0.0000	-1.1280	0.0000	0.5957
	ROTOR	1.0592	0.0000	-4.0092	0.0000	0.2297	0.0000	0.5957
	AIRFRM	-0.1447	0.0000	-2.9968	0.0000	-1.3577	0.0000	0.0000
R	TOTAL	0.0000	6.3477	0.0000	0.0370	0.0000	-0.9427	0.0000
	ROTOR	0.0000	3.9845	0.0000	-0.1694	0.0000	-0.5956	0.0000
	AIRFRM	0.0000	2.3632	0.0000	0.2064	0.0000	-0.3471	0.0000
U	TOTAL	-0.4577	0.0000	-0.3200	0.0000	0.0253	0.0000	-0.7634
	ROTOR	-0.4299	0.0000	-0.0108	0.0000	0.0197	0.0000	-0.7634
	AIRFRM	-0.0278	0.0000	-0.3092	0.0000	0.0056	0.0000	0.0000
V	TOTAL	0.0000	-0.2033	0.0000	-0.0071	0.0000	0.0082	0.0000
	ROTOR	0.0000	-0.0375	0.0000	-0.0001	0.0000	-0.0017	0.0000
	AIRFRM	0.0000	-0.1658	0.0000	-0.0070	0.0000	0.0099	0.0000
W	TOTAL	0.0792	0.0000	-0.8388	0.0000	-0.0172	0.0000	-0.0097
	ROTOR	-0.0019	0.0000	-0.0371	0.0000	0.0043	0.0000	-0.0097
	AIRFRM	0.0811	0.0000	-0.8018	0.0000	-0.0215	0.0000	0.0000
RPM	TOTAL	1.7969	0.0000	0.2806	0.0000	-0.0936	0.0000	3.4210
	ROTOR	1.7873	0.0000	0.0483	0.0000	-0.0824	0.0000	3.4210
	AIRFRM	0.0095	0.0000	0.2324	0.0000	-0.0112	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.5572
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.5572
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	4.9744	0.0000	0.8102	0.0000	-0.2602	0.0000	9.1829
	ROTOR	4.9607	0.0000	0.1193	0.0000	-0.2275	0.0000	9.1829
	AIRFRM	0.0137	0.0000	0.6909	0.0000	-0.0327	0.0000	0.0000
XLN	TOTAL	-0.0582	0.0000	-1.4407	0.0000	-0.6213	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0582	0.0000	-1.4407	0.0000	-0.6213	0.0000	0.0000
XLT	TOTAL	0.0000	0.0055	0.0000	0.1839	0.0000	0.0521	0.0000
	ROTOR	0.0000	0.0055	0.0000	0.0160	0.0000	0.0587	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1679	0.0000	-0.0066	0.0000
XPD	TOTAL	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		----- EARTH REFERENCE -----		
		UE	VE	WE
RATE	(FPS)	270.0	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.3049E-05	0.1582E-06	-.7245E-04

	---------- BODY REFERENCE ----------				
	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	270.0	-.3336E-07	-3.256	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.3950E-06	0.1941E-02	-.1165E-05

----- ATMOSPHERIC CONDITIONS -----	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT.(FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----		
CAL. AIRSPEED (KNOTS)		160.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		86.67
ANGLE OF ATTACK (DEG)		-0.691
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-0.691
YAW ANGLE (DEG)		0.000

----- INERTIAS ----- (SLUGS-FT2)		----- CENTER OF GRAVITY ----- (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

----- CONTROL DISPLACEMENTS -----			
	(+)	(IN)	(PER)
COLL	(UP)	4.7119	47.12
LONG	(FWD)	6.0639	63.17
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ----------			---------- BLADE ----------	
	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	611.1	5449.	4.850	816.9	0.7317
RIGHT	611.1	5449.	4.850	816.9	0.7317
ENGINE	667.1				

----- SWASH PLATE ANGLE (DEG) ----		
	LEFT ROTOR	RIGHT ROTOR
THETA0	60.6504	60.6504
B1	1.5000	1.5000
A1	0.0000	0.0000

------- SURFACE POSITIONS ------- (DEG)	
ELEVATOR	5.9847
AILERON	0.0000
RUDDER	0.0000

---------- ROTOR ----------							
---------- FLAPPING ----------				---- FORCES - MAST AXIS ------			-- JET --
	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.0468	-1.8619	-0.5339	818.95	-110.59	-23.31	-9.10
RIGHT	1.0468	-1.8619	-0.5339	818.95	-110.59	-23.31	-9.10

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6582	0.0042	1.3353	0.3519	0.000629	0.001181	0.014138
RIGHT	0.6582	0.0042	1.3353	0.3519	0.000629	0.001181	0.014138

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02350	0.01571	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02350	0.01571				

TIME USED FOR THIS TRIM = 0.0183 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-232.351	0.000	-569.663	0.000	-6451.485	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1238.922	0.000	-13118.854	0.000	996.204	0.000
TOTAL	-1238.922	0.000	-13118.854	0.000	996.204	0.000
ENGINE PYLONS	-88.039	0.000	1.053	0.000	193.945	0.000
HORIZ. STAB.	-11.266	0.000	465.182	0.000	10175.329	0.000
VERT. STAB.						
FIN NO. 1	-15.704	0.000	0.000	0.000	55.101	-100.769
FIN NO. 2	-15.704	0.000	0.000	0.000	55.101	100.769
TOTAL	-31.408	0.000	0.000	0.000	110.202	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-9.099	0.000	0.000	0.000	20.028	-146.340
RIGHT ENG	-9.099	0.000	0.000	0.000	20.028	146.340
TOTAL	-18.198	0.000	0.000	0.000	40.056	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1620.185	0.000	-13222.282	0.000	5064.253	-0.001
ROTOR						
LEFT ROTOR	819.235	25.241	110.578	3717.558	-2719.687	13484.232
RIGHT ROTOR	819.235	-25.241	110.578	-3717.558	-2719.687	-13484.232
HUB SPINNER	-175.045	0.000	2.101	0.000	375.810	0.000
TOTAL ROTOR	1463.425	0.000	223.257	0.000	-5063.564	0.000
TOTAL AIRCRAFT (BODY AXIS)	-156.760	0.000	-12999.025	0.000	0.689	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.001	0.000	0.029	0.000	0.689	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.8213	0.0000	-0.6844	0.0000	-0.1034	0.0000
	ROTOR	0.0000	-0.1762	0.0000	-0.1436	0.0000	-0.1709	0.0000
	AIRFRM	0.0000	-0.6451	0.0000	-0.5408	0.0000	0.0675	0.0000
Q	TOTAL	0.8558	0.0000	-8.0986	0.0000	-1.2869	0.0000	0.9775
	ROTOR	1.1524	0.0000	-4.5700	0.0000	0.2740	0.0000	0.9775
	AIRFRM	-0.2966	0.0000	-3.5286	0.0000	-1.5609	0.0000	0.0000
R	TOTAL	0.0000	7.4140	0.0000	0.0381	0.0000	-0.9843	0.0000
	ROTOR	0.0000	4.5586	0.0000	-0.1893	0.0000	-0.5670	0.0000
	AIRFRM	0.0000	2.8554	0.0000	0.2274	0.0000	-0.4173	0.0000
U	TOTAL	-0.4654	0.0000	-0.3388	0.0000	0.0263	0.0000	-0.8724
	ROTOR	-0.4288	0.0000	-0.0108	0.0000	0.0197	0.0000	-0.8724
	AIRFRM	-0.0366	0.0000	-0.3280	0.0000	0.0066	0.0000	0.0000
V	TOTAL	0.0000	-0.2404	0.0000	-0.0084	0.0000	0.0098	0.0000
	ROTOR	0.0000	-0.0441	0.0000	-0.0002	0.0000	-0.0019	0.0000
	AIRFRM	0.0000	-0.1963	0.0000	-0.0082	0.0000	0.0117	0.0000
W	TOTAL	-0.0068	0.0000	-0.9435	0.0000	-0.0118	0.0000	-0.0495
	ROTOR	-0.0235	0.0000	-0.0456	0.0000	0.0061	0.0000	-0.0495
	AIRFRM	0.0166	0.0000	-0.8979	0.0000	-0.0179	0.0000	0.0000
RPM	TOTAL	2.0547	0.0000	0.4059	0.0000	-0.1136	0.0000	4.4300
	ROTOR	2.0324	0.0000	0.0671	0.0000	-0.0947	0.0000	4.4300
	AIRFRM	0.0223	0.0000	0.3388	0.0000	-0.0189	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.8985
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.8985
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.2627	0.0000	1.1376	0.0000	-0.2978	0.0000	11.0581
	ROTOR	5.2160	0.0000	0.2072	0.0000	-0.2466	0.0000	11.0581
	AIRFRM	0.0467	0.0000	0.9303	0.0000	-0.0512	0.0000	0.0000
XLN	TOTAL	-0.1096	0.0000	-1.8962	0.0000	-0.8161	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1096	0.0000	-1.8962	0.0000	-0.8161	0.0000	0.0000
XLT	TOTAL	0.0000	0.0054	0.0000	0.2372	0.0000	0.0566	0.0000
	ROTOR	0.0000	0.0054	0.0000	0.0191	0.0000	0.0617	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2181	0.0000	-0.0051	0.0000
XPD	TOTAL	0.0000	-1.3949	0.0000	-0.0388	0.0000	0.1901	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.3949	0.0000	-0.0388	0.0000	0.1901	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

EARTH REFERENCE

		UE	VE	WE
RATE	(FPS)	303.8	0.0000E+00	0.9537E-06
ACCEL	(FPS2)	0.2385E-04	-.4072E-06	-.5820E-04

BODY REFERENCE

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	303.6	0.1547E-06	-11.87	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.4886E-06	0.1299E-02	0.3386E-07

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED (KNOTS)		180.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		109.69
ANGLE OF ATTACK (DEG)		-2.238
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-2.238
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	5.3783	53.78
LONG	(FWD)	6.2338	64.94
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	741.8	6615.	7.605	828.7	0.7423
RIGHT	741.8	6615.	7.605	828.7	0.7423
ENGINE	807.6				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	63.4051	63.4051
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)

ELEVATOR	6.7891
AILERON	0.0000
RUDDER	0.0000

ROTOR — FLAPPING — FORCES - MAST AXIS — JET

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.0846	-2.3930	-0.7559	939.27	-229.85	-18.91	-12.95
RIGHT	1.0846	-2.3930	-0.7559	939.27	-229.85	-18.91	-12.95

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6995	0.0154	1.3732	0.3955	0.000763	0.001354	0.014060
RIGHT	0.6995	0.0154	1.3732	0.3955	0.000763	0.001354	0.014060

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02137	0.01489	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02137	0.01489				

TIME USED FOR THIS TRIM = 0.0180 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-317.609	0.000	-558.882	0.000	-11440.364	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1682.964	0.000	-13732.353	0.000	-214.132	0.000
TOTAL	-1682.964	0.000	-13732.353	0.000	-214.132	0.000
ENGINE PYLONS	-111.198	0.000	4.315	0.000	245.402	0.000
HORIZ. STAB.	13.883	0.000	828.618	0.000	18041.879	0.000
VERT. STAB.						
FIN NO. 1	-20.789	0.000	0.000	0.000	72.940	-133.393
FIN NO. 2	-20.789	0.000	0.000	0.000	72.940	133.393
TOTAL	-41.577	0.000	0.000	0.000	145.880	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-12.948	0.000	0.000	0.000	28.500	-208.243
RIGHT ENG	-12.948	0.000	0.000	0.000	28.500	208.243
TOTAL	-25.895	0.000	0.000	0.000	57.000	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2165.360	0.000	-13458.301	0.000	6835.665	0.000
ROTOR						
LEFT ROTOR	939.452	22.917	229.817	2950.275	-3641.674	15469.039
RIGHT ROTOR	939.452	-22.917	229.817	-2950.274	-3641.674	-15469.039
HUB SPINNER	-221.271	0.000	8.610	0.000	448.144	0.000
TOTAL ROTOR	1657.634	0.000	468.244	0.000	-6835.204	0.000
TOTAL AIRCRAFT (BODY AXIS)	-507.726	0.000	-12990.057	0.000	0.461	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.011	0.000	0.023	0.000	0.461	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 20/12.5 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.9679	0.0000	-0.7831	0.0000	-0.0890	0.0000
	ROTOR	0.0000	-0.1984	0.0000	-0.1738	0.0000	-0.1872	0.0000
	AIRFRM	0.0000	-0.7695	0.0000	-0.6094	0.0000	0.0982	0.0000
Q	TOTAL	0.7708	0.0000	-9.2465	0.0000	-1.4453	0.0000	1.2794
	ROTOR	1.2097	0.0000	-5.1115	0.0000	0.3203	0.0000	1.2794
	AIRFRM	-0.4390	0.0000	-4.1350	0.0000	-1.7657	0.0000	0.0000
R	TOTAL	0.0000	8.5105	0.0000	0.0410	0.0000	-1.0430	0.0000
	ROTOR	0.0000	5.1050	0.0000	-0.2107	0.0000	-0.5476	0.0000
	AIRFRM	0.0000	3.4054	0.0000	0.2517	0.0000	-0.4954	0.0000
U	TOTAL	-0.4797	0.0000	-0.3621	0.0000	0.0279	0.0000	-0.9901
	ROTOR	-0.4324	0.0000	-0.0111	0.0000	0.0199	0.0000	-0.9901
	AIRFRM	-0.0474	0.0000	-0.3510	0.0000	0.0080	0.0000	0.0000
V	TOTAL	0.0000	-0.2814	0.0000	-0.0098	0.0000	0.0119	0.0000
	ROTOR	0.0000	-0.0520	0.0000	-0.0003	0.0000	-0.0022	0.0000
	AIRFRM	0.0000	-0.2294	0.0000	-0.0095	0.0000	0.0140	0.0000
W	TOTAL	-0.0220	0.0000	-1.0650	0.0000	-0.0128	0.0000	-0.0625
	ROTOR	-0.0271	0.0000	-0.0538	0.0000	0.0071	0.0000	-0.0625
	AIRFRM	0.0051	0.0000	-1.0112	0.0000	-0.0199	0.0000	0.0000
RPM	TOTAL	2.3513	0.0000	0.5639	0.0000	-0.1359	0.0000	5.6374
	ROTOR	2.3039	0.0000	0.0906	0.0000	-0.1085	0.0000	5.6374
	AIRFRM	0.0474	0.0000	0.4733	0.0000	-0.0273	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.1437
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.1437
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.6788	0.0000	1.5458	0.0000	-0.3422	0.0000	13.3143
	ROTOR	5.5710	0.0000	0.3137	0.0000	-0.2717	0.0000	13.3143
	AIRFRM	0.1078	0.0000	1.2321	0.0000	-0.0705	0.0000	0.0000
XLN	TOTAL	-0.1815	0.0000	-2.4167	0.0000	-1.0380	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1815	0.0000	-2.4167	0.0000	-1.0380	0.0000	0.0000
XLT	TOTAL	0.0000	0.0055	0.0000	0.2985	0.0000	0.0624	0.0000
	ROTOR	0.0000	0.0055	0.0000	0.0228	0.0000	0.0659	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2757	0.0000	-0.0035	0.0000
XPD	TOTAL	0.0000	-1.7560	0.0000	-0.0489	0.0000	0.2393	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.7560	0.0000	-0.0489	0.0000	0.2393	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL

CONFIGURATION:

NACELLE INCIDENCE	0.0 DEG	GEAR	0.0 % DOWN	ALTITUDE	
FLAP SETTING	20/12.5 DEG	STAB INCIDENCE	0.000 DEG	PRES(MSL)	0.0 FT
ROTOR RPM	589.0 RPM	INERTIA, SLUG-FT2		DENSITY	0.0 FT
GROSS WEIGHT	13000.0 LB	IXX 50950.	IXZ 1075.6	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	298.226 IN	IYY 20348.	IZZ 67168.	TEMP(OAT)	15.00 DEG-C
W.L.	73.586 IN	SIGMAP	1.00000 -ND-	VSOUND	661.48 KTS
		RHO	0.0023769 SLG/FT3	WIND-V	0.00 KTS

U/VKCAS -KTS

NOTE: SYMBOL INDICATES A TRIM PROBLEM

	120.00	140.00	160.00	180.00	0.00	0.00	0.00	0.00
	120.00	140.00	160.00	180.00	0.00	0.00	0.00	0.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	52.9310	59.9186	63.1660	64.9355	0.0000	0.0000	0.0000	0.0000
XLT,%	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000	0.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000	0.0000
XCOL,%	38.2017	41.8443	47.1191	53.7827	0.0000	0.0000	0.0000	0.0000
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	1.5000	1.5000	1.5000	1.5000	0.0000	0.0000	0.0000	0.0000
THETO,DEG	54.6611	57.7375	60.6504	63.4051	0.0000	0.0000	0.0000	0.0000
THOG,DEG	-1.1389	1.9375	4.8504	7.6051	0.0000	0.0000	0.0000	0.0000
ELEVATOR,DEG	1.3323	4.5086	5.9847	6.7891	0.0000	0.0000	0.0000	0.0000
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	-0.9180	-1.3777	-1.8619	-2.3930	0.0000	0.0000	0.0000	0.0000
LTFLP,DEG	-0.1398	-0.3392	-0.5339	-0.7559	0.0000	0.0000	0.0000	0.0000
THRUST,LB	751.00	747.54	818.95	939.27	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CT	0.0011	0.0011	0.0012	0.0014	0.0000	0.0000	0.0000	0.0000
H-FORCE,LB	72.046	-13.946	-110.59	-229.85	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Y-FORCE,LB	-37.599	-28.910	-23.315	-18.908	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
HORSEPOWER	455.36	515.95	611.13	741.82	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
Q,FT-LB	4060.4	4600.7	5449.5	6614.8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
CP	0.0005	0.0005	0.0006	0.0008	0.0000	0.0000	0.0000	0.0000
RPM,ROTOR	589.00	589.00	589.00	589.00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
WI,FT/SEC	1.6440	1.3977	1.3353	1.3732	0.0000	0.0000	0.0000	0.0000
MU	0.0253	0.0087	0.0042	0.0154	0.0000	0.0000	0.0000	0.0000
LAMDA	0.2636	0.3081	0.3519	0.3955	0.0000	0.0000	0.0000	0.0000
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	5.5225	1.6182	-0.6909	-2.2384	0.0000	0.0000	0.0000	0.0000
PITCH,DEG	5.5225	1.6182	-0.6909	-2.2384	0.0000	0.0000	0.0000	0.0000
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	48.7512	66.3558	86.6688	109.6902	0.0000	0.0000	0.0000	0.0000
MACH NUMBER	0.1814	0.2116	0.2419	0.2721	0.0000	0.0000	0.0000	0.0000
VT,KNOTS	120.0000	140.0000	160.0000	180.0000	0.0000	0.0000	0.0000	0.0000
VKCAS,KNOTS	119.9999	139.9999	160.0000	179.9999	0.0000	0.0000	0.0000	0.0000
HP-ENG	499.60	564.75	667.10	807.60	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0013 MIN TOTAL TIME USED IN THIS RUN = 0.3070 MIN

TIME: 22:55:26
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:55:26

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	90.0 degrees
Nacelle Incidence	=	0.0 degrees
Rotor Speed	=	589.0 RPM
Flap/Flaperon Position	=	0/0 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	140, 160, 180, 200, 220 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	236.3	0.2842E-13	0.0000E+00
ACCEL	(FPS2)	0.2797E-04	0.2982E-06	-.1061E-03

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	234.6	0.2908E-06	28.38	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1147E-05	0.2962E-02	-.8345E-07

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	140.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	66.36
ANGLE OF ATTACK	(DEG)	6.899
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	6.899
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY ----- (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	3.8733	38.73
LONG	(FWD)	4.5450	47.34
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	469.6	4187.	1.709	806.4	0.7223
RIGHT	469.6	4187.	1.709	806.4	0.7223
ENGINE	514.9				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETA0	57.5091	57.5091
B1	1.5000	1.5000
A1	0.0000	0.0000

---------- ROTOR ----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.0004	-0.5116	-0.0274	671.35	155.69	-49.81	-6.80
RIGHT	1.0004	-0.5116	-0.0274	671.35	155.69	-49.81	-6.80

------- SURFACE POSITIONS -------

(DEG)

ELEVATOR	-1.2076
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6149	0.0368	1.2639	0.3059	0.000483	0.000968	0.014287
RIGHT	0.6149	0.0368	1.2639	0.3059	0.000483	0.000968	0.014287

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02542	0.01331	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02542	0.01331				

TIME USED FOR THIS TRIM = 0.0220 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-100.928	0.000	-912.792	0.000	4770.578	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	577.201	0.000	-11305.928	0.000	4007.990	0.000
TOTAL	577.201	0.000	-11305.928	0.000	4007.990	0.000
ENGINE PYLONS	-67.008	0.000	-8.038	0.000	146.307	0.000
HORIZ. STAB.	-24.001	0.000	-351.565	0.000	-7610.397	0.000
VERT. STAB.						
FIN NO. 1	-9.950	0.000	0.000	0.000	34.910	-63.844
FIN NO. 2	-9.950	0.000	0.000	0.000	34.910	63.844
TOTAL	-19.899	0.000	0.000	0.000	69.820	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-6.797	0.000	0.000	0.000	14.961	-109.318
RIGHT ENG	-6.797	0.000	0.000	0.000	14.961	109.318
TOTAL	-13.594	0.000	0.000	0.000	29.922	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	351.772	0.000	-12578.323	0.000	1414.219	0.000
ROTOR						
LEFT ROTOR	672.115	47.086	-155.663	6807.228	-891.069	11085.510
RIGHT ROTOR	672.115	-47.086	-155.663	-6807.229	-891.069	-11085.510
HUB SPINNER	-134.413	0.000	-16.177	0.000	368.970	0.000
TOTAL ROTOR	1209.816	0.000	-327.503	-0.001	-1413.167	0.000
TOTAL AIRCRAFT (BODY AXIS)	1561.588	0.000	-12905.826	-0.001	1.052	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.006	0.000	0.044	-0.001	1.052	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6422	0.0000	-0.5638	0.0000	-0.1933	0.0000
	ROTOR	0.0000	-0.1804	0.0000	-0.1328	0.0000	-0.1935	0.0000
	AIRFRM	0.0000	-0.4618	0.0000	-0.4310	0.0000	0.0002	0.0000
Q	TOTAL	1.1195	0.0000	-6.9022	0.0000	-1.1450	0.0000	0.6488
	ROTOR	1.0439	0.0000	-3.9955	0.0000	0.2324	0.0000	0.6488
	AIRFRM	0.0756	0.0000	-2.9068	0.0000	-1.3774	0.0000	0.0000
R	TOTAL	0.0000	5.9666	0.0000	-0.0390	0.0000	-0.9348	0.0000
	ROTOR	0.0000	3.9272	0.0000	-0.1798	0.0000	-0.6379	0.0000
	AIRFRM	0.0000	2.0394	0.0000	0.1408	0.0000	-0.2969	0.0000
U	TOTAL	-0.4528	0.0000	-0.2466	0.0000	0.0268	0.0000	-0.7866
	ROTOR	-0.4431	0.0000	-0.0114	0.0000	0.0204	0.0000	-0.7866
	AIRFRM	-0.0097	0.0000	-0.2352	0.0000	0.0064	0.0000	0.0000
V	TOTAL	0.0000	-0.1905	0.0000	-0.0053	0.0000	0.0057	0.0000
	ROTOR	0.0000	-0.0386	0.0000	-0.0001	0.0000	-0.0017	0.0000
	AIRFRM	0.0000	-0.1519	0.0000	-0.0052	0.0000	0.0074	0.0000
W	TOTAL	0.1524	0.0000	-0.7796	0.0000	-0.0209	0.0000	-0.0031
	ROTOR	0.0081	0.0000	-0.0393	0.0000	0.0040	0.0000	-0.0031
	AIRFRM	0.1443	0.0000	-0.7402	0.0000	-0.0249	0.0000	0.0000
RPM	TOTAL	1.8010	0.0000	0.2275	0.0000	-0.0920	0.0000	3.4279
	ROTOR	1.8079	0.0000	0.0312	0.0000	-0.0821	0.0000	3.4279
	AIRFRM	-0.0068	0.0000	0.1963	0.0000	-0.0099	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.7131
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.7131
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.0730	0.0000	0.5589	0.0000	-0.2498	0.0000	9.3506
	ROTOR	5.1064	0.0000	-0.0247	0.0000	-0.2210	0.0000	9.3506
	AIRFRM	-0.0334	0.0000	0.5836	0.0000	-0.0289	0.0000	0.0000
XLN	TOTAL	0.0212	0.0000	-1.4419	0.0000	-0.6257	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0212	0.0000	-1.4419	0.0000	-0.6257	0.0000	0.0000
XLT	TOTAL	0.0000	0.0078	0.0000	0.2094	0.0000	0.0558	0.0000
	ROTOR	0.0000	0.0078	0.0000	0.0171	0.0000	0.0602	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1923	0.0000	-0.0044	0.0000
XPD	TOTAL	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

```
**********************************************************************
*** VT =160.00 KTS *** NACELLE INCIDENCE =  0.0 DEG  ***   AIRPLANE   ***
*** GW = 13000.0      RPM =  589.00   SLCG =  298.23   WLCG =   73.59 ***
***   MAST ANGLE =  90.00 DEG   *****   FLAP SETTING =      0/0  DEG  ***
**********************************************************************
```

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	270.0	0.0000E+00	-.1907E-05
ACCEL	(FPS2)	-.7771E-04	0.5158E-06	-.1053E-03

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	269.3	0.2819E-06	20.18	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.7414E-05	0.1838E-02	0.4161E-04

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	160.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	86.67
ANGLE OF ATTACK	(DEG)	4.285
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	4.285
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY ----- (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	4.2276	42.28
LONG	(FWD)	4.9665	51.73
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	529.1	4718.	4.663	816.9	0.7317
RIGHT	529.1	4718.	4.663	816.9	0.7317
ENGINE	578.9				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETA0	60.4628	60.4628
B1	1.5000	1.5000
A1	0.0000	0.0000

------- SURFACE POSITIONS -------

	(DEG)
ELEVATOR	0.7884
AILERON	0.0000
RUDDER	0.0000

---------- ROTOR ----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.0006	-0.7868	-0.1524	671.99	103.05	-45.41	-13.38
RIGHT	1.0006	-0.7868	-0.1524	671.99	103.05	-45.41	-13.38

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6242	0.0262	1.1084	0.3507	0.000544	0.000969	0.014282
RIGHT	0.6242	0.0262	1.1084	0.3507	0.000544	0.000969	0.014282

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02353	0.01409	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02353	0.01409				

TIME USED FOR THIS TRIM = 0.0188 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-173.146	0.000	-978.357	0.000	1868.476	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	157.665	0.000	-11538.606	0.000	4442.918	0.000
TOTAL	157.665	0.000	-11538.606	0.000	4442.918	0.000
ENGINE PYLONS	-87.565	0.000	-6.518	0.000	191.783	0.000
HORIZ. STAB.	-41.737	0.000	-221.045	0.000	-4719.691	0.000
VERT. STAB.						
FIN NO. 1	-13.959	0.000	0.000	0.000	48.977	-89.569
FIN NO. 2	-13.959	0.000	0.000	0.000	48.977	89.569
TOTAL	-27.918	0.000	0.000	0.000	97.954	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-13.381	0.000	0.000	0.000	29.453	-215.204
RIGHT ENG	-13.381	0.000	0.000	0.000	29.453	215.204
TOTAL	-26.761	0.000	0.000	0.000	58.906	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-199.461	0.000	-12744.525	0.000	1940.345	0.000
ROTOR						
LEFT ROTOR	672.679	43.608	-103.034	6479.561	-1191.537	11108.135
RIGHT ROTOR	672.679	-43.608	-103.034	-6479.561	-1191.537	-11108.135
HUB SPINNER	-174.670	0.000	-13.033	0.000	443.375	0.000
TOTAL ROTOR	1170.689	0.000	-219.100	0.000	-1939.699	0.000
TOTAL AIRCRAFT (BODY AXIS)	971.228	0.000	-12963.626	0.000	0.645	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.032	0.000	0.042	0.000	0.645	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.7691	0.0000	-0.6576	0.0000	-0.1852	0.0000
	ROTOR	0.0000	-0.1953	0.0000	-0.1599	0.0000	-0.2130	0.0000
	AIRFRM	0.0000	-0.5739	0.0000	-0.4977	0.0000	0.0278	0.0000
Q	TOTAL	1.0086	0.0000	-7.9383	0.0000	-1.3043	0.0000	0.9164
	ROTOR	1.0559	0.0000	-4.5913	0.0000	0.2830	0.0000	0.9164
	AIRFRM	-0.0473	0.0000	-3.3469	0.0000	-1.5874	0.0000	0.0000
R	TOTAL	0.0001	7.0741	0.0000	-0.0482	0.0000	-0.9743	0.0004
	ROTOR	0.0001	4.5361	0.0000	-0.2022	0.0000	-0.6082	0.0004
	AIRFRM	0.0000	2.5380	0.0000	0.1541	0.0000	-0.3661	0.0000
U	TOTAL	-0.4550	0.0000	-0.2562	0.0000	0.0269	0.0000	-0.8998
	ROTOR	-0.4407	0.0000	-0.0111	0.0000	0.0202	0.0000	-0.8998
	AIRFRM	-0.0143	0.0000	-0.2451	0.0000	0.0067	0.0000	0.0000
V	TOTAL	0.0000	-0.2277	0.0000	-0.0060	0.0000	0.0074	0.0000
	ROTOR	0.0000	-0.0452	0.0000	-0.0002	0.0000	-0.0019	0.0000
	AIRFRM	0.0000	-0.1825	0.0000	-0.0058	0.0000	0.0093	0.0000
W	TOTAL	0.1131	0.0000	-0.9128	0.0000	-0.0217	0.0000	-0.0056
	ROTOR	0.0053	0.0000	-0.0457	0.0000	0.0049	0.0000	-0.0056
	AIRFRM	0.1078	0.0000	-0.8671	0.0000	-0.0265	0.0000	0.0000
RPM	TOTAL	2.0549	0.0000	0.3533	0.0000	-0.1096	0.0000	4.4388
	ROTOR	2.0510	0.0000	0.0434	0.0000	-0.0937	0.0000	4.4388
	AIRFRM	0.0038	0.0000	0.3099	0.0000	-0.0159	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.5868
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.5868
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.3220	0.0000	0.8752	0.0000	-0.2779	0.0000	11.2019
	ROTOR	5.3269	0.0000	0.0277	0.0000	-0.2353	0.0000	11.2019
	AIRFRM	-0.0049	0.0000	0.8475	0.0000	-0.0426	0.0000	0.0000
XLN	TOTAL	-0.0138	0.0000	-1.8990	0.0000	-0.8220	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0138	0.0000	-1.8990	0.0000	-0.8220	0.0000	0.0000
XLT	TOTAL	0.0000	0.0079	0.0000	0.2683	0.0000	0.0645	0.0000
	ROTOR	0.0000	0.0079	0.0000	0.0204	0.0000	0.0631	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2479	0.0000	0.0014	0.0000
XPD	TOTAL	0.0000	-1.3949	0.0000	-0.0388	0.0000	0.1901	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.3949	0.0000	-0.0388	0.0000	0.1901	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	303.8	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.9865E-04	0.6211E-06	-.4269E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	303.5	0.1599E-05	13.85	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.3261E-04	0.1306E-02	0.6503E-04

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	180.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		109.69
ANGLE OF ATTACK	(DEG)	2.612
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	2.612
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	4.7220	47.22
LONG	(FWD)	5.2145	54.32
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	621.4	5541.	7.464	828.7	0.7423
RIGHT	621.4	5541.	7.464	828.7	0.7423
ENGINE	678.1				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	63.2643	63.2643
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR — FLAPPING

	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.0195	-1.0696	-0.2715	731.95	44.28	-43.34	-18.80
RIGHT	1.0195	-1.0696	-0.2715	731.95	44.28	-43.34	-18.80

SURFACE POSITIONS (DEG)

ELEVATOR	1.9625
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6512	0.0180	1.0728	0.3950	0.000639	0.001055	0.014228
RIGHT	0.6512	0.0180	1.0728	0.3950	0.000639	0.001055	0.014228

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02141	0.01470	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02141	0.01470				

TIME USED FOR THIS TRIM = 0.0198 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-249.729	0.000	-1064.847	0.000	-1170.094	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-166.556	0.000	-11759.978	0.015	4630.322	0.000
TOTAL	-166.556	0.000	-11759.978	0.015	4630.322	0.000
ENGINE PYLONS	-110.818	0.000	-5.027	0.000	243.186	0.000
HORIZ. STAB.	-50.357	0.000	-58.031	0.000	-1142.493	0.000
VERT. STAB.						
FIN NO. 1	-18.447	-0.001	0.000	-0.002	64.723	-118.352
FIN NO. 2	-18.447	-0.001	0.000	-0.002	64.723	118.380
TOTAL	-36.893	-0.001	0.000	-0.004	129.446	0.028
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-18.802	0.000	0.000	0.000	41.386	-302.394
RIGHT ENG	-18.802	0.000	0.000	0.000	41.386	302.394
TOTAL	-37.603	0.000	0.000	0.000	82.771	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-651.956	-0.001	-12887.884	0.011	2773.138	0.027
ROTOR						
LEFT ROTOR	732.592	42.556	-44.278	6350.120	-1652.043	12099.764
RIGHT ROTOR	732.592	-42.556	-44.278	-6350.121	-1652.043	-12099.764
HUB SPINNER	-220.817	0.000	-10.038	0.000	531.418	0.000
TOTAL ROTOR	1244.368	0.000	-98.594	-0.001	-2772.668	0.000
TOTAL AIRCRAFT (BODY AXIS)	592.412	-0.001	-12986.478	0.009	0.470	0.027
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.044	0.000	0.014	0.010	0.470	0.027

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

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**************************************************************************
*** VT =180.00 KTS *** NACELLE INCIDENCE =  0.0 DEG  ***   AIRPLANE   ***
*** GW = 13000.0      RPM =  589.00   SLCG =  298.23   WLCG =   73.59 ***
***   MAST ANGLE =  90.00 DEG   *****   FLAP SETTING =      0/0  DEG  ***
**************************************************************************
```

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.8924	0.0000	-0.7787	0.0000	-0.1810	0.0000
	ROTOR	0.0000	-0.2095	0.0000	-0.1889	0.0000	-0.2325	0.0000
	AIRFRM	0.0000	-0.6829	0.0000	-0.5898	0.0000	0.0515	0.0000
Q	TOTAL	0.9048	0.0000	-8.9879	0.0000	-1.4690	0.0000	1.1554
	ROTOR	1.0648	0.0000	-5.1576	0.0000	0.3313	0.0000	1.1554
	AIRFRM	-0.1599	0.0000	-3.8302	0.0000	-1.8003	0.0000	0.0000
R	TOTAL	0.0000	8.1332	0.0000	-0.0570	0.0000	-1.0101	0.0000
	ROTOR	0.0000	5.1114	0.0000	-0.2235	0.0000	-0.5772	0.0000
	AIRFRM	0.0000	3.0218	0.0000	0.1665	0.0000	-0.4330	0.0000
U	TOTAL	-0.4540	0.0000	-0.2738	0.0000	0.0275	0.0000	-1.0020
	ROTOR	-0.4355	0.0000	-0.0109	0.0000	0.0200	0.0000	-1.0020
	AIRFRM	-0.0185	0.0000	-0.2629	0.0000	0.0075	0.0000	0.0000
V	TOTAL	0.0000	-0.2648	0.0000	-0.0067	0.0000	0.0091	0.0000
	ROTOR	0.0000	-0.0523	0.0000	-0.0003	0.0000	-0.0022	0.0000
	AIRFRM	0.0000	-0.2125	0.0000	-0.0064	0.0000	0.0112	0.0000
W	TOTAL	0.0887	0.0000	-1.0534	0.0000	-0.0230	0.0000	-0.0080
	ROTOR	0.0032	0.0000	-0.0523	0.0000	0.0057	0.0000	-0.0080
	AIRFRM	0.0855	0.0000	-1.0011	0.0000	-0.0287	0.0000	0.0000
RPM	TOTAL	2.2902	0.0000	0.5320	0.0000	-0.1285	0.0000	5.5579
	ROTOR	2.2841	0.0000	0.0571	0.0000	-0.1050	0.0000	5.5579
	AIRFRM	0.0061	0.0000	0.4749	0.0000	-0.0235	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9334
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9334
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.5727	0.0000	1.2998	0.0000	-0.3105	0.0000	13.2200
	ROTOR	5.5696	0.0000	0.0823	0.0000	-0.2508	0.0000	13.2200
	AIRFRM	0.0031	0.0000	1.2175	0.0000	-0.0597	0.0000	0.0000
XLN	TOTAL	-0.0425	0.0000	-2.4226	0.0000	-1.0474	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0425	0.0000	-2.4226	0.0000	-1.0474	0.0000	0.0000
XLT	TOTAL	0.0000	0.0080	0.0000	0.3363	0.0000	0.0746	0.0000
	ROTOR	0.0000	0.0080	0.0000	0.0240	0.0000	0.0661	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3123	0.0000	0.0085	0.0000
XPD	TOTAL	0.0000	-1.7560	0.0000	-0.0489	0.0000	0.2393	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.7560	0.0000	-0.0489	0.0000	0.2393	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	337.6	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.1065E-03	0.5721E-07	-.4691E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	337.5	0.1592E-07	8.549	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.4592E-08	0.9748E-03	-.7353E-10

ATMOSPHERIC CONDITIONS

ALTITUDE	(FT)	5000.00
DENSITY ALT.	(FT)	0.00
PRESSURE ALT.	(FT)	0.00
AMBIENT TEMP	(DEG-R)	288.16
OUTSIDE AIR TEMP	(DEG-C)	15.00
AIR DENSITY	(SLUGS/FT3)	0.2377E-02
THETES	(ND)	1.00000
DELSTD	(ND)	1.00000
SIGMA PRIME	(ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	200.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	135.42
ANGLE OF ATTACK	(DEG)	1.451
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	1.451
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	5.2859	52.86
LONG	(FWD)	5.3809	56.05
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	734.3	6548.	10.10	841.7	0.7539
RIGHT	734.3	6548.	10.10	841.7	0.7539
ENGINE	799.6				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETAO	65.9029	65.9029
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR — FLAPPING

	AO (DEG)	LONG (DEG)	LAT (DEG)
LEFT	1.0446	-1.3719	-0.4017
RIGHT	1.0446	-1.3719	-0.4017

FORCES - MAST AXIS — JET

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	811.75	-23.28	-42.75	-23.96
RIGHT	811.75	-23.28	-42.75	-23.96

SURFACE POSITIONS (DEG)

ELEVATOR	2.7506
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.6790	0.0111	1.0687	0.4390	0.000755	0.001170	0.014160
RIGHT	0.6790	0.0111	1.0687	0.4390	0.000755	0.001170	0.014160

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01908	0.01521	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01908	0.01521				

TIME USED FOR THIS TRIM = 0.0188 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-329.051	0.000	-1165.649	0.000	-4478.294	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-403.922	0.000	-12000.736	0.000	4603.943	0.000
TOTAL	-403.922	0.000	-12000.736	0.000	4603.943	0.000
ENGINE PYLONS	-136.752	0.000	-3.447	0.000	300.503	0.000
HORIZ. STAB.	-58.459	0.000	134.352	0.000	3074.115	0.000
VERT. STAB.						
FIN NO. 1	-23.442	0.000	0.000	0.000	82.250	-150.419
FIN NO. 2	-23.442	0.000	0.000	0.000	82.250	150.419
TOTAL	-46.884	0.000	0.000	0.000	164.500	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-23.955	0.000	0.000	0.000	52.729	-385.277
RIGHT ENG	-23.955	0.000	0.000	0.000	52.729	385.277
TOTAL	-47.910	0.000	0.000	0.000	105.458	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1022.978	0.000	-13035.480	0.000	3770.224	0.000
ROTOR						
LEFT ROTOR	812.375	43.145	23.275	6266.774	-2200.391	13422.582
RIGHT ROTOR	812.375	-43.145	23.275	-6266.774	-2200.391	-13422.582
HUB SPINNER	-272.494	0.000	-6.882	0.000	630.903	0.000
TOTAL ROTOR	1352.256	0.000	39.669	0.000	-3769.878	0.000
TOTAL AIRCRAFT (BODY AXIS)	329.278	0.000	-12995.812	0.000	0.346	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.043	0.000	0.020	0.000	0.346	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.0143	0.0000	-0.8807	0.0000	-0.1764	0.0000
	ROTOR	0.0000	-0.2230	0.0000	-0.2192	0.0000	-0.2512	0.0000
	AIRFRM	0.0000	-0.7913	0.0000	-0.6614	0.0000	0.0748	0.0000
Q	TOTAL	1.0138	0.0000	-10.1135	0.0000	-1.6501	0.0000	1.3749
	ROTOR	1.0728	0.0000	-5.7100	0.0000	0.3785	0.0000	1.3749
	AIRFRM	-0.0590	0.0000	-4.4035	0.0000	-2.0286	0.0000	0.0000
R	TOTAL	0.0000	9.1711	0.0000	-0.0617	0.0000	-1.0442	0.0000
	ROTOR	0.0000	5.6687	0.0000	-0.2431	0.0000	-0.5451	0.0000
	AIRFRM	0.0000	3.5024	0.0000	0.1814	0.0000	-0.4990	0.0000
U	TOTAL	-0.4528	0.0000	-0.2930	0.0000	0.0284	0.0000	-1.0980
	ROTOR	-0.4286	0.0000	-0.0108	0.0000	0.0197	0.0000	-1.0980
	AIRFRM	-0.0242	0.0000	-0.2822	0.0000	0.0087	0.0000	0.0000
V	TOTAL	0.0000	-0.3022	0.0000	-0.0075	0.0000	0.0108	0.0000
	ROTOR	0.0000	-0.0597	0.0000	-0.0005	0.0000	-0.0024	0.0000
	AIRFRM	0.0000	-0.2425	0.0000	-0.0070	0.0000	0.0132	0.0000
W	TOTAL	0.0563	0.0000	-1.1818	0.0000	-0.0243	0.0000	-0.0107
	ROTOR	0.0013	0.0000	-0.0590	0.0000	0.0065	0.0000	-0.0107
	AIRFRM	0.0551	0.0000	-1.1228	0.0000	-0.0307	0.0000	0.0000
RPM	TOTAL	2.5285	0.0000	0.7283	0.0000	-0.1491	0.0000	6.7679
	ROTOR	2.5044	0.0000	0.0726	0.0000	-0.1159	0.0000	6.7679
	AIRFRM	0.0241	0.0000	0.6557	0.0000	-0.0332	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.1673
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.1673
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.8920	0.0000	1.7552	0.0000	-0.3494	0.0000	15.4494
	ROTOR	5.8455	0.0000	0.1428	0.0000	-0.2683	0.0000	15.4494
	AIRFRM	0.0464	0.0000	1.6123	0.0000	-0.0810	0.0000	0.0000
XLN	TOTAL	-0.0736	0.0000	-3.0143	0.0000	-1.3022	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0736	0.0000	-3.0143	0.0000	-1.3022	0.0000	0.0000
XLT	TOTAL	0.0000	0.0084	0.0000	0.4127	0.0000	0.0857	0.0000
	ROTOR	0.0000	0.0084	0.0000	0.0278	0.0000	0.0691	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3849	0.0000	0.0166	0.0000
XPD	TOTAL	0.0000	-2.1563	0.0000	-0.0600	0.0000	0.2938	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.1563	0.0000	-0.0600	0.0000	0.2938	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	371.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.5685E-06	-.4466E-06	-.3739E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	371.3	-.7494E-08	4.023	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1689E-06	0.2629E-02	-.2189E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		220.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		163.86
ANGLE OF ATTACK (DEG)		0.621
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		0.621
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	5.8945	58.95
LONG	(FWD)	5.4994	57.29
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	868.6	7745.	12.59	855.8	0.7665
RIGHT	868.6	7745.	12.59	855.8	0.7665
ENGINE	943.9				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	68.3867	68.3867
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	3.3117
AILERON	0.0000
RUDDER	0.0000

ROTOR FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.0742	-1.6888	-0.5466	906.27	-99.68	-43.69	-29.12
RIGHT	1.0742	-1.6888	-0.5466	906.27	-99.68	-43.69	-29.12

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7049	0.0052	1.0804	0.4829	0.000893	0.001307	0.014085
RIGHT	0.7049	0.0052	1.0804	0.4829	0.000893	0.001307	0.014085

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01653	0.01564	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01653	0.01564				

TIME USED FOR THIS TRIM = 0.0185 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-411.722	0.000	-1281.293	0.000	-8048.508	-0.003
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-584.509	0.000	-12263.796	0.000	4421.299	0.000
TOTAL	-584.509	0.000	-12263.796	0.000	4421.299	0.000
ENGINE PYLONS	-165.378	0.000	-1.784	0.000	363.760	0.000
HORIZ. STAB.	-65.590	0.000	352.027	0.000	7840.062	0.000
VERT. STAB.						
FIN NO. 1	-28.943	0.000	0.000	0.000	101.552	-185.719
FIN NO. 2	-28.943	0.000	0.000	0.000	101.552	185.719
TOTAL	-57.886	0.000	0.000	0.000	203.104	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-29.120	0.000	0.000	0.000	64.098	-468.344
RIGHT ENG	-29.120	0.000	0.000	0.000	64.098	468.344
TOTAL	-58.240	0.000	0.000	0.000	128.195	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1343.324	0.000	-13194.846	0.000	4907.914	-0.003
ROTOR						
LEFT ROTOR	906.893	45.425	99.661	6234.092	-2824.299	14994.591
RIGHT ROTOR	906.893	-45.425	99.661	-6234.092	-2824.299	-14994.591
HUB SPINNER	-329.609	0.000	-3.561	0.000	741.617	0.000
TOTAL ROTOR	1484.177	0.000	195.760	0.000	-4906.980	0.000
TOTAL AIRCRAFT (BODY AXIS)	140.853	0.000	-12999.086	0.000	0.934	-0.003
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.002	0.000	0.151	0.000	0.934	-0.003

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 589.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.1358	0.0000	-0.9864	0.0000	-0.1722	0.0000
	ROTOR	0.0000	-0.2359	0.0000	-0.2510	0.0000	-0.2692	0.0000
	AIRFRM	0.0000	-0.8999	0.0000	-0.7354	0.0000	0.0969	0.0000
Q	TOTAL	0.9460	0.0000	-11.3050	0.0000	-1.8243	0.0000	1.5743
	ROTOR	1.0789	0.0000	-6.2519	0.0000	0.4251	0.0000	1.5743
	AIRFRM	-0.1329	0.0000	-5.0531	0.0000	-2.2494	0.0000	0.0000
R	TOTAL	0.0000	10.1944	0.0000	-0.0642	0.0000	-1.0777	0.0000
	ROTOR	0.0000	6.2112	0.0000	-0.2612	0.0000	-0.5126	0.0000
	AIRFRM	0.0000	3.9832	0.0000	0.1969	0.0000	-0.5651	0.0000
U	TOTAL	-0.4500	0.0000	-0.3132	0.0000	0.0294	0.0000	-1.1871
	ROTOR	-0.4207	0.0000	-0.0107	0.0000	0.0193	0.0000	-1.1871
	AIRFRM	-0.0294	0.0000	-0.3025	0.0000	0.0101	0.0000	0.0000
V	TOTAL	0.0000	-0.3401	0.0000	-0.0084	0.0000	0.0125	0.0000
	ROTOR	0.0000	-0.0677	0.0000	-0.0007	0.0000	-0.0027	0.0000
	AIRFRM	0.0000	-0.2724	0.0000	-0.0077	0.0000	0.0152	0.0000
W	TOTAL	0.0761	0.0000	-1.3173	0.0000	-0.0275	0.0000	-0.0070
	ROTOR	0.0044	0.0000	-0.0680	0.0000	0.0073	0.0000	-0.0070
	AIRFRM	0.0716	0.0000	-1.2493	0.0000	-0.0347	0.0000	0.0000
RPM	TOTAL	2.7582	0.0000	0.9538	0.0000	-0.1710	0.0000	8.0632
	ROTOR	2.7130	0.0000	0.0899	0.0000	-0.1265	0.0000	8.0632
	AIRFRM	0.0452	0.0000	0.8640	0.0000	-0.0445	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.3170
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.3170
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	6.2018	0.0000	2.2638	0.0000	-0.3909	0.0000	17.7874
	ROTOR	6.1076	0.0000	0.2089	0.0000	-0.2857	0.0000	17.7874
	AIRFRM	0.0942	0.0000	2.0549	0.0000	-0.1052	0.0000	0.0000
XLN	TOTAL	-0.1078	0.0000	-3.6752	0.0000	-1.5868	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1078	0.0000	-3.6752	0.0000	-1.5868	0.0000	0.0000
XLT	TOTAL	0.0000	0.0090	0.0000	0.4974	0.0000	0.0979	0.0000
	ROTOR	0.0000	0.0090	0.0000	0.0319	0.0000	0.0722	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.4655	0.0000	0.0257	0.0000
XPD	TOTAL	0.0000	-2.5950	0.0000	-0.0722	0.0000	0.3536	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.5950	0.0000	-0.0722	0.0000	0.3536	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION — DATE: 5MAY'89
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL — PAGE 1

CONFIGURATION:

NACELLE INCIDENCE	0.0 DEG	GEAR	0.0 % DOWN	ALTITUDE	
FLAP SETTING	0/0 DEG	STAB INCIDENCE	0.000 DEG	PRES(MSL)	0.0 FT
ROTOR RPM	589.0 RPM	INERTIA, SLUG-FT2		DENSITY	0.0 FT
GROSS WEIGHT	13000.0 LB	IXX 50950.	IXZ 1075.6	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	298.226 IN	IYY 20348.	IZZ 67168.	TEMP(OAT)	15.00 DEG-C
W.L.	73.586 IN	SIGMAP	1.00000 -ND-	VSOUND	661.48 KTS
		RHO	0.0023769 SLG/FT3	WIND-V	0.00 KTS

U/VKCAS -KTS — NOTE: SYMBOL INDICATES A TRIM PROBLEM

	140.00	160.00	180.00	200.00	220.00	0.00	0.00	0.00
	140.00	160.00	180.00	200.00	220.00	0.00	0.00	0.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	47.3434	51.7344	54.3173	56.0511	57.2855	0.0000	0.0000	0.0000
XLT,%	50.0000	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	50.0000	0.0000	0.0000	0.0000
XCOL,%	38.7334	42.2756	47.2201	52.8588	58.9451	0.0000	0.0000	0.0000
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	1.5000	1.5000	1.5000	1.5000	1.5000	0.0000	0.0000	0.0000
THETO,DEG	57.5091	60.4628	63.2643	65.9029	68.3867	0.0000	0.0000	0.0000
THOG,DEG	1.7091	4.6628	7.4643	10.1029	12.5867	0.0000	0.0000	0.0000
ELEVATOR,DEG	-1.2076	0.7884	1.9625	2.7506	3.3117	0.0000	0.0000	0.0000
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	-0.5116	-0.7868	-1.0696	-1.3719	-1.6888	0.0000	0.0000	0.0000
LTFLP,DEG	-0.0274	-0.1524	-0.2715	-0.4017	-0.5466	0.0000	0.0000	0.0000
THRUST,LB	671.35	671.99	731.95	811.75	906.27	0.00000E+00	0.00000E+00	0.00000E+00
CT	0.0010	0.0010	0.0011	0.0012	0.0013	0.0000	0.0000	0.0000
H-FORCE,LB	155.69	103.05	44.285	-23.278	-99.675	0.00000E+00	0.00000E+00	0.00000E+00
Y-FORCE,LB	-49.810	-45.413	-43.336	-42.746	-43.692	0.00000E+00	0.00000E+00	0.00000E+00
HORSEPOWER	469.59	529.11	621.36	734.33	868.58	0.00000E+00	0.00000E+00	0.00000E+00
Q,FT-LB	4187.3	4718.0	5540.7	6548.0	7745.1	0.00000E+00	0.00000E+00	0.00000E+00
CP	0.0005	0.0005	0.0006	0.0008	0.0009	0.0000	0.0000	0.0000
RPM,ROTOR	589.00	589.00	589.00	589.00	589.00	0.00000E+00	0.00000E+00	0.00000E+00
WI,FT/SEC	1.2639	1.1084	1.0728	1.0687	1.0804	0.0000	0.0000	0.0000
MU	0.0368	0.0262	0.0180	0.0111	0.0052	0.0000	0.0000	0.0000
LAMDA	0.3059	0.3507	0.3950	0.4390	0.4829	0.0000	0.0000	0.0000
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	6.8991	4.2847	2.6121	1.4512	0.6208	0.0000	0.0000	0.0000
PITCH,DEG	6.8991	4.2847	2.6121	1.4512	0.6208	0.0000	0.0000	0.0000
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	66.3558	86.6688	109.6902	135.4200	163.8583	0.0000	0.0000	0.0000
MACH NUMBER	0.2116	0.2419	0.2721	0.3024	0.3326	0.0000	0.0000	0.0000
VT,KNOTS	140.0000	160.0000	180.0000	200.0000	220.0000	0.0000	0.0000	0.0000
VKCAS,KNOTS	139.9999	160.0000	179.9999	200.0001	220.0000	0.0000	0.0000	0.0000
HP-ENG	514.91	578.90	678.10	799.55	943.91	0.00000E+00	0.00000E+00	0.00000E+00

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0017 MIN TOTAL TIME USED IN THIS RUN = 0.3618 MIN

TIME: 22:50:14
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:50:14

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	90.0 degrees
Nacelle Incidence	=	0.0 degrees
Rotor Speed	=	517.0 RPM
Flap/Flaperon Position	=	0/0 degrees
Altitude	=	Sea Level Standard Day
True Airspeeds	=	140, 160, 180, 200, 220, 240, 260, 280 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	236.3	-.2842E-13	0.0000E+00
ACCEL	(FPS2)	-.3512E-04	0.3301E-07	-.3502E-04

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	234.6	0.2660E-06	28.57	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.4107E-06	0.1563E-02	0.1933E-05

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	140.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		66.36
ANGLE OF ATTACK	(DEG)	6.944
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	6.944
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY ----- (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	3.3198	33.20
LONG	(FWD)	4.5382	47.27
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	416.9	4235.	4.701	716.8	0.6421
RIGHT	416.9	4235.	4.701	716.8	0.6421
ENGINE	458.2				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETA0	60.5015	60.5015
B1	1.5000	1.5000
A1	0.0000	0.0000

---------- ROTOR ----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	A0 (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.1902	-0.2169	0.0896	680.41	156.97	-50.05	-9.74
RIGHT	1.1902	-0.2169	0.0896	680.41	156.97	-50.05	-9.74

------- SURFACE POSITIONS -------

	(DEG)
ELEVATOR	-1.2398
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7020	0.0422	1.2809	0.3484	0.000634	0.001273	0.014088
RIGHT	0.7020	0.0422	1.2809	0.3484	0.000634	0.001273	0.014088

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.04142	0.01291	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.04142	0.01291				

TIME USED FOR THIS TRIM = 0.0212 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-100.261	0.000	-915.570	0.000	4827.380	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	573.883	0.000	-11291.417	0.000	4005.614	0.000
TOTAL	573.883	0.000	-11291.417	0.000	4005.614	0.000
ENGINE PYLONS	-67.017	0.000	-8.091	0.000	146.319	0.000
HORIZ. STAB.	-23.576	0.000	-359.388	0.000	-7782.080	0.000
VERT. STAB.						
FIN NO. 1	-9.937	0.000	0.000	0.000	34.866	-63.762
FIN NO. 2	-9.937	0.000	0.000	0.000	34.866	63.764
TOTAL	-19.874	0.000	0.000	0.000	69.732	0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-9.739	0.000	0.000	0.000	21.438	-156.643
RIGHT ENG	-9.739	0.000	0.000	0.000	21.438	156.643
TOTAL	-19.479	0.000	0.000	0.000	42.876	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	343.676	0.000	-12574.466	0.000	1309.841	0.002
ROTOR						
LEFT ROTOR	681.184	47.304	-156.944	6875.867	-839.406	11205.648
RIGHT ROTOR	681.184	-47.304	-156.944	-6875.867	-839.406	-11205.648
HUB SPINNER	-134.444	0.000	-16.285	0.000	369.525	0.000
TOTAL ROTOR	1227.925	0.000	-330.173	0.000	-1309.286	0.000
TOTAL AIRCRAFT (BODY AXIS)	1571.601	0.000	-12904.639	0.000	0.555	0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.016	0.000	0.012	0.000	0.555	0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6316	0.0000	-0.5715	0.0000	-0.1928	0.0000
	ROTOR	0.0000	-0.1704	0.0000	-0.1406	0.0000	-0.1931	0.0000
	AIRFRM	0.0000	-0.4612	0.0000	-0.4310	0.0000	0.0002	0.0000
Q	TOTAL	0.9450	0.0000	-6.8295	0.0000	-1.1602	0.0000	0.7434
	ROTOR	0.8750	0.0000	-3.9661	0.0000	0.2193	0.0000	0.7434
	AIRFRM	0.0700	0.0000	-2.8634	0.0000	-1.3795	0.0000	0.0000
R	TOTAL	0.0000	5.9472	0.0000	-0.0497	0.0000	-0.8317	0.0000
	ROTOR	0.0000	3.9104	0.0000	-0.1904	0.0000	-0.5375	0.0000
	AIRFRM	0.0000	2.0368	0.0000	0.1407	0.0000	-0.2942	0.0000
U	TOTAL	-0.3824	0.0000	-0.2495	0.0000	0.0237	0.0000	-0.7591
	ROTOR	-0.3753	0.0000	-0.0094	0.0000	0.0172	0.0000	-0.7591
	AIRFRM	-0.0071	0.0000	-0.2401	0.0000	0.0065	0.0000	0.0000
V	TOTAL	0.0000	-0.1904	0.0000	-0.0053	0.0000	0.0057	0.0000
	ROTOR	0.0000	-0.0386	0.0000	-0.0002	0.0000	-0.0017	0.0000
	AIRFRM	0.0000	-0.1518	0.0000	-0.0052	0.0000	0.0074	0.0000
W	TOTAL	0.1551	0.0000	-0.7788	0.0000	-0.0209	0.0000	0.0030
	ROTOR	0.0112	0.0000	-0.0394	0.0000	0.0042	0.0000	0.0030
	AIRFRM	0.1439	0.0000	-0.7393	0.0000	-0.0251	0.0000	0.0000
RPM	TOTAL	1.7420	0.0000	0.2741	0.0000	-0.0918	0.0000	3.8001
	ROTOR	1.7621	0.0000	0.0283	0.0000	-0.0799	0.0000	3.8001
	AIRFRM	-0.0201	0.0000	0.2458	0.0000	-0.0119	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9834
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.9834
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.9455	0.0000	0.5538	0.0000	-0.1992	0.0000	8.4024
	ROTOR	4.0073	0.0000	-0.0527	0.0000	-0.1704	0.0000	8.4024
	AIRFRM	-0.0618	0.0000	0.6065	0.0000	-0.0288	0.0000	0.0000
XLN	TOTAL	0.0225	0.0000	-1.4419	0.0000	-0.6257	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0225	0.0000	-1.4419	0.0000	-0.6257	0.0000	0.0000
XLT	TOTAL	0.0000	0.0054	0.0000	0.2079	0.0000	0.0426	0.0000
	ROTOR	0.0000	0.0054	0.0000	0.0157	0.0000	0.0472	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1923	0.0000	-0.0047	0.0000
XPD	TOTAL	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.0737	0.0000	-0.0299	0.0000	0.1463	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	270.0	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.9620E-04	0.3085E-06	-.2483E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	269.3	0.2279E-06	20.40	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.4413E-07	0.2289E-02	-.2674E-07

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	160.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	86.67
ANGLE OF ATTACK	(DEG)	4.332
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	4.332
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	3.6006	36.01
LONG	(FWD)	4.9548	51.61
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	475.2	4828.	7.879	728.6	0.6526
RIGHT	475.2	4828.	7.879	728.6	0.6526
ENGINE	521.0				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETAO	63.6790	63.6790
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR — FLAPPING

	AO (DEG)	LONG (DEG)	LAT (DEG)
LEFT	1.1904	-0.5816	-0.0708
RIGHT	1.1904	-0.5816	-0.0708

ROTOR — FORCES - MAST AXIS — JET

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	680.80	104.77	-46.33	-16.19
RIGHT	680.80	104.77	-46.33	-16.19

SURFACE POSITIONS (DEG)

ELEVATOR	0.7331
AILERON	0.0000
RUDDER	0.0000

ROTOR

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7041	0.0301	1.1229	0.3995	0.000723	0.001274	0.014082
RIGHT	0.7041	0.0301	1.1229	0.3995	0.000723	0.001274	0.014082

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03930	0.01380	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03930	0.01380				

TIME USED FOR THIS TRIM = 0.0183 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-172.573	0.000	-982.205	0.000	1946.892	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	155.578	0.000	-11523.171	0.000	4437.715	0.000
TOTAL	155.578	0.000	-11523.171	0.000	4437.715	0.000
ENGINE PYLONS	-87.575	0.000	-6.589	0.000	191.793	0.000
HORIZ. STAB.	-41.650	0.000	-228.115	0.000	-4874.120	0.000
VERT. STAB.						
FIN NO. 1	-13.942	0.000	0.000	0.000	48.916	-89.458
FIN NO. 2	-13.942	0.000	0.000	0.000	48.916	89.458
TOTAL	-27.883	0.000	0.000	0.000	97.832	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-16.194	0.000	0.000	0.000	35.645	-260.447
RIGHT ENG	-16.194	0.000	0.000	0.000	35.645	260.447
TOTAL	-32.387	0.000	0.000	0.000	71.290	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-206.491	0.000	-12740.080	0.000	1871.402	0.000
ROTOR						
LEFT ROTOR	681.504	44.491	-104.757	6618.969	-1157.330	11235.614
RIGHT ROTOR	681.504	-44.491	-104.757	-6618.969	-1157.330	-11235.614
HUB SPINNER	-174.691	0.000	-13.177	0.000	444.072	0.000
TOTAL ROTOR	1188.316	0.000	-222.691	0.000	-1870.589	0.000
TOTAL AIRCRAFT (BODY AXIS)	981.825	0.000	-12962.771	0.000	0.813	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.046	0.000	0.097	0.000	0.813	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.7537	0.0000	-0.6664	0.0000	-0.1819	0.0000
	ROTOR	0.0000	-0.1805	0.0000	-0.1687	0.0000	-0.2098	0.0000
	AIRFRM	0.0000	-0.5732	0.0000	-0.4977	0.0000	0.0279	0.0000
Q	TOTAL	0.8324	0.0000	-7.8560	0.0000	-1.3210	0.0000	0.9681
	ROTOR	0.8828	0.0000	-4.5593	0.0000	0.2688	0.0000	0.9681
	AIRFRM	-0.0504	0.0000	-3.2967	0.0000	-1.5898	0.0000	0.0000
R	TOTAL	0.0000	7.0526	0.0000	-0.0571	0.0000	-0.8657	0.0000
	ROTOR	0.0000	4.5177	0.0000	-0.2110	0.0000	-0.5026	0.0000
	AIRFRM	0.0000	2.5349	0.0000	0.1539	0.0000	-0.3630	0.0000
U	TOTAL	-0.3813	0.0000	-0.2602	0.0000	0.0238	0.0000	-0.8581
	ROTOR	-0.3695	0.0000	-0.0092	0.0000	0.0169	0.0000	-0.8581
	AIRFRM	-0.0118	0.0000	-0.2510	0.0000	0.0069	0.0000	0.0000
V	TOTAL	0.0000	-0.2276	0.0000	-0.0061	0.0000	0.0073	0.0000
	ROTOR	0.0000	-0.0453	0.0000	-0.0003	0.0000	-0.0020	0.0000
	AIRFRM	0.0000	-0.1823	0.0000	-0.0058	0.0000	0.0093	0.0000
W	TOTAL	0.1160	0.0000	-0.9120	0.0000	-0.0215	0.0000	0.0010
	ROTOR	0.0084	0.0000	-0.0458	0.0000	0.0051	0.0000	0.0010
	AIRFRM	0.1075	0.0000	-0.8662	0.0000	-0.0266	0.0000	0.0000
RPM	TOTAL	1.9677	0.0000	0.4275	0.0000	-0.1094	0.0000	4.8858
	ROTOR	1.9783	0.0000	0.0409	0.0000	-0.0903	0.0000	4.8858
	AIRFRM	-0.0106	0.0000	0.3866	0.0000	-0.0191	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.2858
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.2858
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	4.1669	0.0000	0.8798	0.0000	-0.2264	0.0000	10.1128
	ROTOR	4.2031	0.0000	-0.0021	0.0000	-0.1835	0.0000	10.1128
	AIRFRM	-0.0362	0.0000	0.8819	0.0000	-0.0429	0.0000	0.0000
XLN	TOTAL	-0.0129	0.0000	-1.8990	0.0000	-0.8220	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0129	0.0000	-1.8990	0.0000	-0.8220	0.0000	0.0000
XLT	TOTAL	0.0000	0.0057	0.0000	0.2666	0.0000	0.0507	0.0000
	ROTOR	0.0000	0.0057	0.0000	0.0186	0.0000	0.0496	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2479	0.0000	0.0011	0.0000
XPD	TOTAL	0.0000	-1.3949	0.0000	-0.0388	0.0000	0.1901	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.3949	0.0000	-0.0388	0.0000	0.1901	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	303.8	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.1588E-03	-.8937E-07	-.7231E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	303.5	0.1579E-06	14.12	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.6353E-06	0.2312E-02	0.3270E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT.(FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		180.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		109.69
ANGLE OF ATTACK (DEG)		2.665
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		2.665
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	4.2127	42.13
LONG	(FWD)	5.1984	54.15
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	566.6	5756.	10.87	741.8	0.6644
RIGHT	566.6	5756.	10.87	741.8	0.6644
ENGINE	619.2				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	66.6669	66.6669
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	1.8862
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2128	-0.9499	-0.2235	741.09	46.83	-45.49	-21.46
RIGHT	1.2128	-0.9499	-0.2235	741.09	46.83	-45.49	-21.46

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7231	0.0209	1.0862	0.4500	0.000862	0.001387	0.014019
RIGHT	0.7231	0.0209	1.0862	0.4500	0.000862	0.001387	0.014019

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03693	0.01448	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03693	0.01448				

TIME USED FOR THIS TRIM = 0.0182 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-248.852	0.000	-1070.321	0.000	-1058.591	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-168.371	0.000	-11741.555	0.000	4622.856	0.000
TOTAL	-168.371	0.000	-11741.555	0.000	4622.856	0.000
ENGINE PYLONS	-110.829	0.000	-5.129	0.000	243.194	0.000
HORIZ. STAB.	-50.545	0.000	-65.030	0.000	-1294.711	0.000
VERT. STAB.						
FIN NO. 1	-18.422	0.000	0.000	0.000	64.637	-118.206
FIN NO. 2	-18.422	0.000	0.000	0.000	64.637	118.210
TOTAL	-36.844	0.000	0.000	-0.001	129.274	0.004
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-21.463	0.000	0.000	0.000	47.244	-345.202
RIGHT ENG	-21.463	0.000	0.000	0.000	47.244	345.202
TOTAL	-42.927	0.000	0.000	0.000	94.489	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-658.368	0.000	-12882.035	-0.001	2736.511	0.004
ROTOR						
LEFT ROTOR	741.770	44.669	-46.820	6611.137	-1634.032	12246.408
RIGHT ROTOR	741.770	-44.669	-46.820	-6611.137	-1634.032	-12246.408
HUB SPINNER	-220.834	0.000	-10.242	0.000	532.374	0.000
TOTAL ROTOR	1262.707	0.000	-103.882	0.000	-2735.690	0.000
TOTAL AIRCRAFT (BODY AXIS)	604.339	0.000	-12985.916	-0.001	0.821	0.004
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.065	0.000	0.026	-0.001	0.821	0.004

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.8709	0.0000	-0.7883	0.0000	-0.1748	0.0000
	ROTOR	0.0000	-0.1889	0.0000	-0.1985	0.0000	-0.2265	0.0000
	AIRFRM	0.0000	-0.6820	0.0000	-0.5898	0.0000	0.0517	0.0000
Q	TOTAL	0.7269	0.0000	-8.9041	0.0000	-1.4869	0.0000	1.1638
	ROTOR	0.8876	0.0000	-5.1199	0.0000	0.3158	0.0000	1.1638
	AIRFRM	-0.1607	0.0000	-3.7842	0.0000	-1.8027	0.0000	0.0000
R	TOTAL	0.0000	8.1051	0.0000	-0.0642	0.0000	-0.8970	0.0000
	ROTOR	0.0000	5.0874	0.0000	-0.2306	0.0000	-0.4675	0.0000
	AIRFRM	0.0000	3.0178	0.0000	0.1664	0.0000	-0.4295	0.0000
U	TOTAL	-0.3774	0.0000	-0.2786	0.0000	0.0244	0.0000	-0.9451
	ROTOR	-0.3614	0.0000	-0.0091	0.0000	0.0166	0.0000	-0.9451
	AIRFRM	-0.0160	0.0000	-0.2695	0.0000	0.0078	0.0000	0.0000
V	TOTAL	0.0000	-0.2646	0.0000	-0.0069	0.0000	0.0090	0.0000
	ROTOR	0.0000	-0.0523	0.0000	-0.0005	0.0000	-0.0022	0.0000
	AIRFRM	0.0000	-0.2123	0.0000	-0.0064	0.0000	0.0112	0.0000
W	TOTAL	0.0917	0.0000	-1.0523	0.0000	-0.0228	0.0000	-0.0006
	ROTOR	0.0064	0.0000	-0.0524	0.0000	0.0059	0.0000	-0.0006
	AIRFRM	0.0853	0.0000	-0.9999	0.0000	-0.0287	0.0000	0.0000
RPM	TOTAL	2.1742	0.0000	0.6373	0.0000	-0.1285	0.0000	6.0703
	ROTOR	2.1823	0.0000	0.0550	0.0000	-0.1004	0.0000	6.0703
	AIRFRM	-0.0081	0.0000	0.5822	0.0000	-0.0281	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.6453
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.6453
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	4.3749	0.0000	1.3042	0.0000	-0.2571	0.0000	11.9559
	ROTOR	4.4033	0.0000	0.0504	0.0000	-0.1970	0.0000	11.9559
	AIRFRM	-0.0284	0.0000	1.2538	0.0000	-0.0601	0.0000	0.0000
XLN	TOTAL	-0.0409	0.0000	-2.4226	0.0000	-1.0475	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0409	0.0000	-2.4226	0.0000	-1.0475	0.0000	0.0000
XLT	TOTAL	0.0000	0.0061	0.0000	0.3342	0.0000	0.0603	0.0000
	ROTOR	0.0000	0.0061	0.0000	0.0219	0.0000	0.0520	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3123	0.0000	0.0082	0.0000
XPD	TOTAL	0.0000	-1.7560	0.0000	-0.0489	0.0000	0.2393	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.7560	0.0000	-0.0489	0.0000	0.2393	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	337.6	0.0000E+00	0.9537E-06
ACCEL	(FPS2)	0.1242E-03	0.4858E-06	-.4633E-04

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	337.4	0.1574E-06	8.897	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.5941E-06	0.1127E-02	0.1652E-07

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	200.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	135.42
ANGLE OF ATTACK	(DEG)	1.510
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	1.510
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY ----- (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	4.8631	48.63
LONG	(FWD)	5.3610	55.84
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	678.6	6894.	13.65	756.3	0.6774
RIGHT	678.6	6894.	13.65	756.3	0.6774
ENGINE	739.7				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETAO	69.4517	69.4517
B1	1.5000	1.5000
A1	0.0000	0.0000

---------- ROTOR ----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.2427	-1.3390	-0.3919	821.18	-19.50	-46.87	-26.46
RIGHT	1.2427	-1.3390	-0.3919	821.18	-19.50	-46.87	-26.46

------- SURFACE POSITIONS -------

(DEG)

ELEVATOR	2.6563
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7433	0.0131	1.0813	0.5002	0.001032	0.001537	0.013943
RIGHT	0.7433	0.0131	1.0813	0.5002	0.001032	0.001537	0.013943

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03432	0.01505	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03432	0.01505				

TIME USED FOR THIS TRIM = 0.0185 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-328.139	0.000	-1173.234	0.000	-4323.855	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-405.254	0.000	-11977.366	0.000	4592.673	0.000
TOTAL	-405.254	0.000	-11977.366	0.000	4592.673	0.000
ENGINE PYLONS	-136.764	0.000	-3.587	0.000	300.510	0.000
HORIZ. STAB.	-58.657	0.000	126.891	0.000	2911.844	0.000
VERT. STAB.						
FIN NO. 1	-23.408	0.000	0.000	0.000	82.131	-150.201
FIN NO. 2	-23.408	0.000	0.000	0.000	82.131	150.201
TOTAL	-46.816	0.000	0.000	0.000	164.261	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-26.462	0.000	0.000	0.000	58.247	-425.592
RIGHT ENG	-26.462	0.000	0.000	0.000	58.247	425.592
TOTAL	-52.923	0.000	0.000	0.000	116.493	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1028.553	0.000	-13027.298	0.000	3761.926	0.000
ROTOR						
LEFT ROTOR	821.871	47.202	19.498	6682.801	-2196.865	13592.078
RIGHT ROTOR	821.871	-47.202	19.498	-6682.802	-2196.865	-13592.078
HUB SPINNER	-272.510	0.000	-7.162	0.000	632.205	0.000
TOTAL ROTOR	1371.231	0.000	31.834	0.000	-3761.526	0.000
TOTAL AIRCRAFT (BODY AXIS)	342.678	0.000	-12995.464	-0.001	0.400	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.050	0.000	0.020	-0.001	0.400	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.9858	0.0000	-0.8908	0.0000	-0.1671	0.0000
	ROTOR	0.0000	-0.1956	0.0000	-0.2294	0.0000	-0.2421	0.0000
	AIRFRM	0.0000	-0.7902	0.0000	-0.6614	0.0000	0.0750	0.0000
Q	TOTAL	0.8354	0.0000	-10.0448	0.0000	-1.6684	0.0000	1.3366
	ROTOR	0.8914	0.0000	-5.6663	0.0000	0.3617	0.0000	1.3366
	AIRFRM	-0.0560	0.0000	-4.3785	0.0000	-2.0301	0.0000	0.0000
R	TOTAL	0.0000	9.1349	0.0000	-0.0672	0.0000	-0.9274	0.0000
	ROTOR	0.0000	5.6376	0.0000	-0.2484	0.0000	-0.4322	0.0000
	AIRFRM	0.0000	3.4973	0.0000	0.1812	0.0000	-0.4953	0.0000
U	TOTAL	-0.3741	0.0000	-0.2978	0.0000	0.0252	0.0000	-1.0250
	ROTOR	-0.3522	0.0000	-0.0090	0.0000	0.0162	0.0000	-1.0250
	AIRFRM	-0.0219	0.0000	-0.2888	0.0000	0.0090	0.0000	0.0000
V	TOTAL	0.0000	-0.3019	0.0000	-0.0077	0.0000	0.0107	0.0000
	ROTOR	0.0000	-0.0597	0.0000	-0.0007	0.0000	-0.0025	0.0000
	AIRFRM	0.0000	-0.2422	0.0000	-0.0070	0.0000	0.0132	0.0000
W	TOTAL	0.0595	0.0000	-1.1807	0.0000	-0.0241	0.0000	-0.0023
	ROTOR	0.0046	0.0000	-0.0590	0.0000	0.0067	0.0000	-0.0023
	AIRFRM	0.0549	0.0000	-1.1217	0.0000	-0.0308	0.0000	0.0000
RPM	TOTAL	2.3834	0.0000	0.8671	0.0000	-0.1495	0.0000	7.3332
	ROTOR	2.3713	0.0000	0.0710	0.0000	-0.1099	0.0000	7.3332
	AIRFRM	0.0121	0.0000	0.7961	0.0000	-0.0395	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.2035
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.2035
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	4.6246	0.0000	1.7597	0.0000	-0.2928	0.0000	13.9414
	ROTOR	4.6105	0.0000	0.1084	0.0000	-0.2113	0.0000	13.9414
	AIRFRM	0.0141	0.0000	1.6513	0.0000	-0.0815	0.0000	0.0000
XLN	TOTAL	-0.0711	0.0000	-3.0143	0.0000	-1.3023	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0711	0.0000	-3.0143	0.0000	-1.3023	0.0000	0.0000
XLT	TOTAL	0.0000	0.0068	0.0000	0.4102	0.0000	0.0708	0.0000
	ROTOR	0.0000	0.0068	0.0000	0.0253	0.0000	0.0545	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3849	0.0000	0.0163	0.0000
XPD	TOTAL	0.0000	-2.1563	0.0000	-0.0600	0.0000	0.2938	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.1563	0.0000	-0.0600	0.0000	0.2938	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		----- EARTH REFERENCE ----- UE	VE	WE
RATE	(FPS)	371.3	-.1421E-13	-.4768E-06
ACCEL	(FPS2)	-.2094E-04	0.7675E-06	-.3665E-03

	---------- BODY REFERENCE ---------- UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	371.3	0.1203E-06	4.453	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.5892E-07	0.2447E-02	-.7819E-06

----- ATMOSPHERIC CONDITIONS -----	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

----- FLIGHT PATH CONDITIONS -----		
CAL. AIRSPEED	(KNOTS)	220.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		163.86
ANGLE OF ATTACK	(DEG)	0.687
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	0.687
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)		----- CENTER OF GRAVITY ----- (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

----- CONTROL DISPLACEMENTS -----	(+)	(IN)	(PER)
COLL	(UP)	5.5470	55.47
LONG	(FWD)	5.4759	57.04
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ----------	POWER (SHP)	TORQUE (FT-LBS)	---------- BLADE ---------- GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	812.1	8250.	16.25	771.9	0.6914
RIGHT	812.1	8250.	16.25	771.9	0.6914
ENGINE	883.1				

----- SWASH PLATE ANGLE (DEG) ----	LEFT ROTOR	RIGHT ROTOR
THETAO	72.0465	72.0465
B1	1.5000	1.5000
A1	0.0000	0.0000

------- SURFACE POSITIONS ------- (DEG)	
ELEVATOR	3.2005
AILERON	0.0000
RUDDER	0.0000

---------- ROTOR ---------- ---------- FLAPPING ----------	AO (DEG)	LONG (DEG)	LAT (DEG)	---- FORCES - MAST AXIS ------ THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	1.2781	-1.7415	-0.5810	916.24	-94.01	-50.58	-31.49
RIGHT	1.2781	-1.7415	-0.5810	916.24	-94.01	-50.58	-31.49

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7623	0.0066	1.0927	0.5502	0.001235	0.001715	0.013864
RIGHT	0.7623	0.0066	1.0927	0.5502	0.001235	0.001715	0.013864

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03149	0.01554	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03149	0.01554				

TIME USED FOR THIS TRIM = 0.0185 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-410.773	0.000	-1291.607	0.000	-7838.433	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-585.345	0.000	-12232.696	0.000	4404.566	0.000
TOTAL	-585.345	0.000	-12232.696	0.000	4404.566	0.000
ENGINE PYLONS	-165.393	0.000	-1.974	0.000	363.766	0.000
HORIZ. STAB.	-66.169	0.000	343.316	0.000	7651.453	0.000
VERT. STAB.						
FIN NO. 1	-28.897	0.000	0.000	0.000	101.390	-185.423
FIN NO. 2	-28.897	0.000	0.000	0.000	101.390	185.423
TOTAL	-57.794	0.000	0.000	0.000	202.780	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-31.493	0.000	0.000	0.000	69.321	-506.511
RIGHT ENG	-31.493	0.000	0.000	0.000	69.321	506.511
TOTAL	-62.986	0.000	0.000	0.000	138.642	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1348.460	0.000	-13182.962	0.000	4922.776	0.000
ROTOR						
LEFT ROTOR	916.987	52.211	93.993	6845.271	-2832.642	15196.365
RIGHT ROTOR	916.987	-52.211	93.993	-6845.271	-2832.642	-15196.366
HUB SPINNER	-329.628	0.000	-3.942	0.000	743.377	0.000
TOTAL ROTOR	1504.346	0.000	184.044	0.000	-4921.907	-0.001
TOTAL AIRCRAFT (BODY AXIS)	155.886	0.000	-12998.918	0.000	0.869	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.010	0.000	0.148	0.000	0.869	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.0994	0.0000	-0.9967	0.0000	-0.1597	0.0000
	ROTOR	0.0000	-0.2009	0.0000	-0.2614	0.0000	-0.2569	0.0000
	AIRFRM	0.0000	-0.8984	0.0000	-0.7354	0.0000	0.0972	0.0000
Q	TOTAL	0.7663	0.0000	-11.2680	0.0000	-1.8421	0.0000	1.4868
	ROTOR	0.8934	0.0000	-6.2023	0.0000	0.4071	0.0000	1.4868
	AIRFRM	-0.1271	0.0000	-5.0656	0.0000	-2.2492	0.0000	0.0000
R	TOTAL	0.0000	10.1490	0.0000	-0.0679	0.0000	-0.9580	0.0000
	ROTOR	0.0000	6.1722	0.0000	-0.2646	0.0000	-0.3970	0.0000
	AIRFRM	0.0000	3.9768	0.0000	0.1967	0.0000	-0.5609	0.0000
U	TOTAL	-0.3696	0.0000	-0.3182	0.0000	0.0262	0.0000	-1.0973
	ROTOR	-0.3424	0.0000	-0.0090	0.0000	0.0157	0.0000	-1.0973
	AIRFRM	-0.0272	0.0000	-0.3092	0.0000	0.0104	0.0000	0.0000
V	TOTAL	0.0000	-0.3397	0.0000	-0.0086	0.0000	0.0124	0.0000
	ROTOR	0.0000	-0.0676	0.0000	-0.0009	0.0000	-0.0027	0.0000
	AIRFRM	0.0000	-0.2721	0.0000	-0.0077	0.0000	0.0151	0.0000
W	TOTAL	0.0794	0.0000	-1.3153	0.0000	-0.0273	0.0000	0.0035
	ROTOR	0.0080	0.0000	-0.0680	0.0000	0.0075	0.0000	0.0035
	AIRFRM	0.0713	0.0000	-1.2474	0.0000	-0.0348	0.0000	0.0000
RPM	TOTAL	2.5827	0.0000	1.1292	0.0000	-0.1718	0.0000	8.6708
	ROTOR	2.5470	0.0000	0.0888	0.0000	-0.1191	0.0000	8.6708
	AIRFRM	0.0358	0.0000	1.0404	0.0000	-0.0528	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.4143
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.4143
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	4.8867	0.0000	2.2838	0.0000	-0.3329	0.0000	16.0843
	ROTOR	4.8260	0.0000	0.1719	0.0000	-0.2264	0.0000	16.0843
	AIRFRM	0.0607	0.0000	2.1119	0.0000	-0.1066	0.0000	0.0000
XLN	TOTAL	-0.1042	0.0000	-3.6753	0.0000	-1.5870	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1042	0.0000	-3.6753	0.0000	-1.5870	0.0000	0.0000
XLT	TOTAL	0.0000	0.0078	0.0000	0.4947	0.0000	0.0825	0.0000
	ROTOR	0.0000	0.0078	0.0000	0.0291	0.0000	0.0571	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.4656	0.0000	0.0254	0.0000
XPD	TOTAL	0.0000	-2.5950	0.0000	-0.0722	0.0000	0.3536	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.5950	0.0000	-0.0722	0.0000	0.3536	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	405.1	0.0000E+00	0.5960E-07
ACCEL	(FPS2)	0.1422E-02	-.5801E-06	0.7469E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	405.1	-.3224E-08	0.8656	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.2297E-06	0.1362E-01	-.2607E-05

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	240.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		195.00
ANGLE OF ATTACK	(DEG)	0.122
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	0.122
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	6.3996	64.00
LONG	(FWD)	5.5531	57.85
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE — BLADE

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	985.1	0.1001E+05	18.69	788.7	0.7065
RIGHT	985.1	0.1001E+05	18.69	788.7	0.7065
ENGINE	1069.				

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETAO	74.4863	74.4863
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)

ELEVATOR	3.5660
AILERON	0.0000
RUDDER	0.0000

ROTOR — FLAPPING

	AO (DEG)	LONG (DEG)	LAT (DEG)
LEFT	1.3269	-2.1300	-0.7854
RIGHT	1.3269	-2.1300	-0.7854

ROTOR — FORCES - MAST AXIS / JET

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1047.19	-173.87	-57.21	-35.78
RIGHT	1047.19	-173.87	-57.21	-35.78

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7835	0.0013	1.1417	0.6002	0.001498	0.001960	0.013771
RIGHT	0.7835	0.0013	1.1417	0.6002	0.001498	0.001960	0.013771

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02845	0.01593	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02845	0.01593				

TIME USED FOR THIS TRIM = 0.0152 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-497.585	0.000	-1432.558	0.000	-11458.532	-0.003
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-768.060	0.000	-12490.065	0.000	4158.488	0.000
TOTAL	-768.060	0.000	-12490.065	0.000	4158.488	0.000
ENGINE PYLONS	-196.767	0.000	-0.419	0.000	433.055	0.000
HORIZ. STAB.	-71.808	0.000	575.926	0.000	12739.557	0.000
VERT. STAB.						
FIN NO. 1	-34.858	0.000	0.000	0.000	122.305	-223.672
FIN NO. 2	-34.858	0.000	0.000	0.000	122.305	223.672
TOTAL	-69.716	0.000	0.000	0.000	244.610	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-35.780	0.000	0.000	0.000	78.758	-575.461
RIGHT ENG	-35.780	0.000	0.000	0.000	78.758	575.461
TOTAL	-71.560	0.000	0.000	0.000	157.515	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1675.496	0.000	-13347.117	0.000	6274.693	-0.003
ROTOR						
LEFT ROTOR	1048.030	60.236	173.841	7330.258	-3568.475	17398.416
RIGHT ROTOR	1048.030	-60.236	173.841	-7330.258	-3568.475	-17398.416
HUB SPINNER	-392.210	0.000	-0.836	0.000	867.096	0.000
TOTAL ROTOR	1703.850	0.000	346.846	0.000	-6269.854	0.000
TOTAL AIRCRAFT (BODY AXIS)	28.354	0.000	-13000.271	0.000	4.838	-0.003
TOTAL AIRCRAFT (INERTIAL AXIS)	0.575	0.000	-0.301	0.000	4.838	-0.003

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.2123	0.0000	-1.2016	0.0000	-0.1539	0.0000
	ROTOR	0.0000	-0.2059	0.0000	-0.2958	0.0000	-0.2725	0.0000
	AIRFRM	0.0000	-1.0064	0.0000	-0.9058	0.0000	0.1186	0.0000
Q	TOTAL	0.6970	0.0000	-12.5679	0.0000	-2.0187	0.0000	1.6074
	ROTOR	0.8900	0.0000	-6.7206	0.0000	0.4516	0.0000	1.6074
	AIRFRM	-0.1930	0.0000	-5.8473	0.0000	-2.4703	0.0000	0.0000
R	TOTAL	0.0000	11.1391	0.0000	-0.0680	0.0000	-0.9890	0.0000
	ROTOR	0.0000	6.6843	0.0000	-0.2806	0.0000	-0.3628	0.0000
	AIRFRM	0.0000	4.4548	0.0000	0.2126	0.0000	-0.6262	0.0000
U	TOTAL	-0.3559	0.0000	-0.3617	0.0000	0.0272	0.0000	-1.1602
	ROTOR	-0.3321	0.0000	-0.0089	0.0000	0.0153	0.0000	-1.1602
	AIRFRM	-0.0238	0.0000	-0.3529	0.0000	0.0119	0.0000	0.0000
V	TOTAL	0.0000	-0.3781	0.0000	-0.0096	0.0000	0.0141	0.0000
	ROTOR	0.0000	-0.0762	0.0000	-0.0012	0.0000	-0.0030	0.0000
	AIRFRM	0.0000	-0.3020	0.0000	-0.0084	0.0000	0.0171	0.0000
W	TOTAL	0.0668	0.0000	-1.4656	0.0000	-0.0290	0.0000	0.0057
	ROTOR	0.0080	0.0000	-0.0757	0.0000	0.0083	0.0000	0.0057
	AIRFRM	0.0588	0.0000	-1.3899	0.0000	-0.0374	0.0000	0.0000
RPM	TOTAL	2.7083	0.0000	1.5942	0.0000	-0.1954	0.0000	10.1025
	ROTOR	2.7149	0.0000	0.1077	0.0000	-0.1280	0.0000	10.1025
	AIRFRM	-0.0066	0.0000	1.4865	0.0000	-0.0674	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.7021
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-4.7021
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.0247	0.0000	3.2265	0.0000	-0.3771	0.0000	18.4132
	ROTOR	5.0514	0.0000	0.2379	0.0000	-0.2421	0.0000	18.4132
	AIRFRM	-0.0267	0.0000	2.9886	0.0000	-0.1349	0.0000	0.0000
XLN	TOTAL	-0.1390	0.0000	-4.4068	0.0000	-1.9022	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1390	0.0000	-4.4068	0.0000	-1.9022	0.0000	0.0000
XLT	TOTAL	0.0000	0.0093	0.0000	0.5875	0.0000	0.0955	0.0000
	ROTOR	0.0000	0.0093	0.0000	0.0332	0.0000	0.0599	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.5543	0.0000	0.0356	0.0000
XPD	TOTAL	0.0000	-3.0716	0.0000	-0.0855	0.0000	0.4185	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-3.0716	0.0000	-0.0855	0.0000	0.4185	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	438.8	0.0000E+00	-.2384E-06
ACCEL	(FPS2)	-.1682E-04	0.0000E+00	-.3280E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	438.8	0.0000E+00	-2.028	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.0000E+00	0.1156E-01	0.0000E+00

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		260.01
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		228.86
ANGLE OF ATTACK (DEG)		-0.265
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		-0.265
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	7.3781	73.78
LONG	(FWD)	5.6047	58.38
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	1210.	0.1230E+05	20.98	806.6	0.7224
RIGHT	1210.	0.1230E+05	20.98	806.6	0.7224
ENGINE	1311.				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	76.7767	76.7767
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR - FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.3916	-2.4971	-1.0081	1220.93	-261.36	-66.98	-39.22
RIGHT	1.3916	-2.4971	-1.0081	1220.93	-261.36	-66.98	-39.22

SURFACE POSITIONS (DEG)	
ELEVATOR	3.8101
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8054	0.0030	1.2294	0.6502	0.001841	0.002285	0.013683
RIGHT	0.8054	0.0030	1.2294	0.6502	0.001841	0.002285	0.013683

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02521	0.01580	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02521	0.01580				

TIME USED FOR THIS TRIM = 0.0153 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-596.904	0.000	-1597.074	0.000	-15157.047	-0.004
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-977.981	0.000	-12751.496	0.000	3901.241	0.000
TOTAL	-977.981	0.000	-12751.496	0.000	3901.241	0.000
ENGINE PYLONS	-230.914	0.000	1.062	0.000	508.437	0.000
HORIZ. STAB.	-76.664	0.000	823.008	0.000	18141.441	0.000
VERT. STAB.						
FIN NO. 1	-41.355	0.000	0.000	0.000	145.100	-265.360
FIN NO. 2	-41.355	0.000	0.000	0.000	145.100	265.360
TOTAL	-82.710	0.000	0.000	0.000	290.200	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-39.223	0.000	0.000	0.000	86.337	-630.842
RIGHT ENG	-39.223	0.000	0.000	0.000	86.337	630.842
TOTAL	-78.447	0.000	0.000	0.000	172.674	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2043.620	0.000	-13524.498	0.000	7856.947	-0.004
ROTOR						
LEFT ROTOR	1221.909	71.534	261.324	8230.107	-4428.208	20311.717
RIGHT ROTOR	1221.909	-71.534	261.324	-8230.107	-4428.208	-20311.717
HUB SPINNER	-460.283	0.000	2.121	0.000	1003.573	0.000
TOTAL ROTOR	1983.535	0.000	524.769	0.000	-7852.843	0.000
TOTAL AIRCRAFT (BODY AXIS)	-60.084	0.000	-12999.729	0.000	4.104	-0.004
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.006	0.000	0.133	0.000	4.104	-0.004

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.3257	0.0000	-1.2946	0.0000	-0.1038	0.0000
	ROTOR	0.0000	-0.2093	0.0000	-0.3182	0.0000	-0.2449	0.0000
	AIRFRM	0.0000	-1.1163	0.0000	-0.9764	0.0000	0.1410	0.0000
Q	TOTAL	0.7707	0.0000	-13.8069	0.0000	-2.2109	0.0000	2.2647
	ROTOR	1.0219	0.0000	-7.1913	0.0000	0.4876	0.0000	2.2647
	AIRFRM	-0.2513	0.0000	-6.6156	0.0000	-2.6985	0.0000	0.0000
R	TOTAL	0.0000	12.1144	0.0000	-0.0698	0.0000	-1.0267	0.0000
	ROTOR	0.0000	7.1731	0.0000	-0.2989	0.0000	-0.3341	0.0000
	AIRFRM	0.0000	4.9413	0.0000	0.2291	0.0000	-0.6926	0.0000
U	TOTAL	-0.3530	0.0000	-0.3874	0.0000	0.0287	0.0000	-1.2358
	ROTOR	-0.3246	0.0000	-0.0087	0.0000	0.0149	0.0000	-1.2358
	AIRFRM	-0.0284	0.0000	-0.3787	0.0000	0.0138	0.0000	0.0000
V	TOTAL	0.0000	-0.4177	0.0000	-0.0106	0.0000	0.0158	0.0000
	ROTOR	0.0000	-0.0855	0.0000	-0.0015	0.0000	-0.0033	0.0000
	AIRFRM	0.0000	-0.3322	0.0000	-0.0091	0.0000	0.0191	0.0000
W	TOTAL	-0.0473	0.0000	-1.7534	0.0000	-0.0230	0.0000	-0.1276
	ROTOR	-0.0324	0.0000	-0.0899	0.0000	0.0115	0.0000	-0.1276
	AIRFRM	-0.0150	0.0000	-1.6636	0.0000	-0.0345	0.0000	0.0000
RPM	TOTAL	2.9108	0.0000	1.9502	0.0000	-0.2232	0.0000	11.7331
	ROTOR	2.9014	0.0000	0.1284	0.0000	-0.1379	0.0000	11.7331
	AIRFRM	0.0094	0.0000	1.8219	0.0000	-0.0853	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-5.8571
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-5.8571
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.3393	0.0000	3.9687	0.0000	-0.4315	0.0000	21.1413
	ROTOR	5.3360	0.0000	0.3088	0.0000	-0.2609	0.0000	21.1413
	AIRFRM	0.0034	0.0000	3.6599	0.0000	-0.1706	0.0000	0.0000
XLN	TOTAL	-0.1753	0.0000	-5.2098	0.0000	-2.2483	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1753	0.0000	-5.2098	0.0000	-2.2483	0.0000	0.0000
XLT	TOTAL	0.0000	0.0114	0.0000	0.6890	0.0000	0.1104	0.0000
	ROTOR	0.0000	0.0114	0.0000	0.0380	0.0000	0.0633	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.6510	0.0000	0.0471	0.0000
XPD	TOTAL	0.0000	-3.5852	0.0000	-0.0998	0.0000	0.4885	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-3.5852	0.0000	-0.0998	0.0000	0.4885	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	472.6	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.9794E-05	0.0000E+00	-.2402E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	472.6	0.0000E+00	-4.727	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.0000E+00	0.7504E-02	0.0000E+00

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	0.00
PRESSURE ALT. (FT)	0.00
AMBIENT TEMP (DEG-R)	288.16
OUTSIDE AIR TEMP (DEG-C)	15.00
AIR DENSITY (SLUGS/FT3)	0.2377E-02
THETES (ND)	1.00000
DELSTD (ND)	1.00000
SIGMA PRIME (ND)	1.00000

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED	(KNOTS)	280.01
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		265.42
ANGLE OF ATTACK	(DEG)	-0.573
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	-0.573
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)			
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CENTER OF GRAVITY (IN)	
S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	8.2257	82.26
LONG	(FWD)	5.6490	58.84
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	1474.	0.1498E+05	23.11	825.4	0.7393
RIGHT	1474.	0.1498E+05	23.11	825.4	0.7393
ENGINE	1595.				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	78.9073	78.9073
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	4.0200
AILERON	0.0000
RUDDER	0.0000

ROTOR - FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.4626	-2.8728	-1.2646	1411.35	-362.50	-79.61	-42.75
RIGHT	1.4626	-2.8728	-1.2646	1411.35	-362.50	-79.61	-42.75

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8233	0.0070	1.3221	0.7002	0.002242	0.002641	0.013618
RIGHT	0.8233	0.0070	1.3221	0.7002	0.002242	0.002641	0.013618

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02179	0.01551	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02179	0.01551				

TIME USED FOR THIS TRIM = 0.0153 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-706.394	0.000	-1774.370	0.000	-19155.088	-0.004
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-1184.378	0.000	-13052.074	0.000	3596.438	0.000
TOTAL	-1184.378	0.000	-13052.074	0.000	3596.438	0.000
ENGINE PYLONS	-267.791	0.000	2.667	0.000	589.847	0.000
HORIZ. STAB.	-80.411	0.000	1094.316	0.000	24069.066	0.000
VERT. STAB.						
FIN NO. 1	-48.402	0.000	0.000	0.000	169.826	-310.579
FIN NO. 2	-48.402	0.000	0.000	0.000	169.826	310.579
TOTAL	-96.804	0.000	0.000	0.000	339.652	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-42.753	0.000	0.000	0.000	94.106	-687.609
RIGHT ENG	-42.753	0.000	0.000	0.000	94.106	687.609
TOTAL	-85.506	0.000	0.000	0.000	188.212	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-2421.285	0.000	-13729.462	0.000	9628.127	-0.004
ROTOR						
LEFT ROTOR	1412.524	85.924	362.442	9306.029	-5388.187	23517.174
RIGHT ROTOR	1412.524	-85.924	362.442	-9306.029	-5388.187	-23517.174
HUB SPINNER	-533.797	0.000	5.325	0.000	1150.912	0.000
TOTAL ROTOR	2291.251	0.000	730.209	0.000	-9625.462	0.000
TOTAL AIRCRAFT (BODY AXIS)	-130.034	0.000	-12999.253	0.000	2.665	-0.004
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.003	0.000	0.097	0.000	2.665	-0.004

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-1.4515	0.0000	-1.3933	0.0000	-0.0941	0.0000
	ROTOR	0.0000	-0.2201	0.0000	-0.3589	0.0000	-0.2568	0.0000
	AIRFRM	0.0000	-1.2314	0.0000	-1.0343	0.0000	0.1627	0.0000
Q	TOTAL	0.7287	0.0000	-15.2415	0.0000	-2.4048	0.0000	2.5097
	ROTOR	1.0431	0.0000	-7.6738	0.0000	0.5303	0.0000	2.5097
	AIRFRM	-0.3144	0.0000	-7.5677	0.0000	-2.9352	0.0000	0.0000
R	TOTAL	0.0000	13.1020	0.0000	-0.0706	0.0000	-1.0691	0.0000
	ROTOR	0.0000	7.6513	0.0000	-0.3173	0.0000	-0.3071	0.0000
	AIRFRM	0.0000	5.4507	0.0000	0.2467	0.0000	-0.7620	0.0000
U	TOTAL	-0.3512	0.0000	-0.4235	0.0000	0.0307	0.0000	-1.3038
	ROTOR	-0.3180	0.0000	-0.0085	0.0000	0.0146	0.0000	-1.3038
	AIRFRM	-0.0332	0.0000	-0.4149	0.0000	0.0161	0.0000	0.0000
V	TOTAL	0.0000	-0.4589	0.0000	-0.0117	0.0000	0.0177	0.0000
	ROTOR	0.0000	-0.0954	0.0000	-0.0018	0.0000	-0.0036	0.0000
	AIRFRM	0.0000	-0.3635	0.0000	-0.0098	0.0000	0.0213	0.0000
W	TOTAL	-0.0751	0.0000	-1.8999	0.0000	-0.0237	0.0000	-0.1531
	ROTOR	-0.0372	0.0000	-0.1012	0.0000	0.0128	0.0000	-0.1531
	AIRFRM	-0.0379	0.0000	-1.7987	0.0000	-0.0365	0.0000	0.0000
RPM	TOTAL	3.1180	0.0000	2.3501	0.0000	-0.2545	0.0000	13.5054
	ROTOR	3.0903	0.0000	0.1510	0.0000	-0.1481	0.0000	13.5054
	AIRFRM	0.0277	0.0000	2.1991	0.0000	-0.1063	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-5.9512
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-5.9512
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	5.7058	0.0000	4.8474	0.0000	-0.4975	0.0000	24.2622
	ROTOR	5.6677	0.0000	0.3897	0.0000	-0.2827	0.0000	24.2622
	AIRFRM	0.0381	0.0000	4.4577	0.0000	-0.2148	0.0000	0.0000
XLN	TOTAL	-0.2174	0.0000	-6.1115	0.0000	-2.6368	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.2174	0.0000	-6.1115	0.0000	-2.6368	0.0000	0.0000
XLT	TOTAL	0.0000	0.0142	0.0000	0.7991	0.0000	0.1263	0.0000
	ROTOR	0.0000	0.0142	0.0000	0.0434	0.0000	0.0671	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.7557	0.0000	0.0592	0.0000
XPD	TOTAL	0.0000	-4.1377	0.0000	-0.1151	0.0000	0.5638	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-4.1377	0.0000	-0.1151	0.0000	0.5638	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, SEA LEVEL

CONFIGURATION:

NACELLE INCIDENCE	0.0 DEG	GEAR	0.0 % DOWN		ALTITUDE		
FLAP SETTING	0/0 DEG	STAB INCIDENCE	0.000 DEG		PRES(MSL)	0.0 FT	
ROTOR RPM	517.0 RPM	INERTIA, SLUG-FT2			DENSITY	0.0 FT	
GROSS WEIGHT	13000.0 LB	IXX	50950.	IXZ 1075.6	HEIGHT(AGL)	5000.0 FT (OGE)	
C.G. F.S.	298.226 IN	IYY	20348.	IZZ 67168.	TEMP(OAT)	15.00 DEG-C	
W.L.	73.586 IN	SIGMAP	1.00000 -ND-		VSOUND	661.48 KTS	
		RHO	0.0023769 SLG/FT3		WIND-V	0.00 KTS	

U/VKCAS -KTS — NOTE: SYMBOL INDICATES A TRIM PROBLEM

	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00
	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00
AIRCRAFT CONTROL SETTINGS:								
XLN,%	47.2726	51.6127	54.1496	55.8437	57.0409	57.8450	58.3819	58.8437
XLT,%	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
XCOL,%	33.1977	36.0062	42.1273	48.6307	55.4700	63.9956	73.7812	82.2573
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000
THETO,DEG	60.5015	63.6790	66.6669	69.4517	72.0465	74.4863	76.7767	78.9073
THOG,DEG	4.7015	7.8790	10.8669	13.6517	16.2465	18.6863	20.9767	23.1073
ELEVATOR,DEG	-1.2398	0.7331	1.8862	2.6563	3.2005	3.5660	3.8101	4.0200
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	-0.2169	-0.5816	-0.9499	-1.3390	-1.7415	-2.1300	-2.4971	-2.8728
LTFLP,DEG	0.0896	-0.0708	-0.2235	-0.3919	-0.5810	-0.7854	-1.0081	-1.2646
THRUST,LB	680.41	680.80	741.09	821.18	916.24	1047.2	1220.9	1411.3
CT	0.0013	0.0013	0.0014	0.0015	0.0017	0.0020	0.0023	0.0026
H-FORCE,LB	156.97	104.77	46.828	-19.501	-94.007	-173.87	-261.36	-362.50
Y-FORCE,LB	-50.051	-46.327	-45.493	-46.869	-50.578	-57.210	-66.983	-79.610
HORSEPOWER	416.86	475.22	566.60	678.63	812.07	985.13	1210.5	1474.2
Q,FT-LB	4234.8	4827.7	5756.0	6894.1	8249.7	10008.	12297.	14976.
CP	0.0006	0.0007	0.0009	0.0010	0.0012	0.0015	0.0018	0.0022
RPM,ROTOR	517.00	517.00	517.00	517.00	517.00	517.00	517.00	517.00
WI,FT/SEC	1.2809	1.1229	1.0862	1.0813	1.0927	1.1417	1.2294	1.3221
MU	0.0422	0.0301	0.0209	0.0131	0.0066	0.0013	0.0030	0.0070
LAMDA	0.3484	0.3995	0.4500	0.5002	0.5502	0.6002	0.6502	0.7002
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	6.9437	4.3316	2.6648	1.5103	0.6871	0.1224	-0.2648	-0.5731
PITCH,DEG	6.9437	4.3316	2.6648	1.5103	0.6871	0.1224	-0.2648	-0.5731
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	66.3558	86.6688	109.6902	135.4200	163.8583	195.0049	228.8599	265.4234
MACH NUMBER	0.2116	0.2419	0.2721	0.3024	0.3326	0.3628	0.3931	0.4233
VT,KNOTS	140.0000	160.0000	180.0000	200.0000	220.0000	240.0000	260.0000	280.0001
VKCAS,KNOTS	139.9999	160.0000	179.9999	200.0001	220.0000	240.0000	260.0000	280.0001
HP-ENG	458.20	520.96	619.20	739.67	883.15	1069.2	1311.5	1595.0

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0018 MIN TOTAL TIME USED IN THIS RUN = 0.4730 MIN

TIME: 22:45:18
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 22:45:18

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	90.0 degrees
Nacelle Incidence	=	0.0 degrees
Rotor Speed	=	517.0 RPM
Flap/Flaperon Position	=	0/0 degrees
Altitude	=	12,000 feet Standard Day
True Airspeeds	=	140, 150, 180, 200, 220, 240, 260, 280 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	236.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.1637E-02	0.6860E-07	0.1828E-01

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	231.3	0.0000E+00	48.47	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.3596E-06	0.3632E-01	-.1986E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	12001.49
PRESSURE ALT. (FT)	12000.00
AMBIENT TEMP (DEG-R)	264.39
OUTSIDE AIR TEMP (DEG-C)	-8.77
AIR DENSITY (SLUGS/FT3)	0.1648E-02
THETES (ND)	0.91750
DELSTD (ND)	0.63599
SIGMA PRIME (ND)	0.69318

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		117.29
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		46.00
ANGLE OF ATTACK (DEG)		11.837
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		11.837
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	5.0078	50.08
LONG	(FWD)	3.3248	34.63
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	408.3	4148.	4.865	716.8	0.6703
RIGHT	408.3	4148.	4.865	716.8	0.6703
ENGINE	449.0				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	60.6649	60.6649
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2338	0.8792	0.5874	797.50	218.24	-43.11	-10.22
RIGHT	1.2338	0.8792	0.5874	797.50	218.24	-43.11	-10.22

SURFACE POSITIONS (DEG)	
ELEVATOR	-6.9851
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8399	0.0716	2.1547	0.3448	0.000896	0.002153	0.013749
RIGHT	0.8399	0.0716	2.1547	0.3448	0.000896	0.002153	0.013749

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03567	0.01125	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03567	0.01125				

TIME USED FOR THIS TRIM = 0.0338 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-38.428	0.000	-851.304	0.000	6013.668	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	1274.349	0.000	-11030.908	0.000	3034.194	0.000
TOTAL	1274.349	0.000	-11030.908	0.000	3034.194	0.000
ENGINE PYLONS	-46.342	0.000	-9.570	0.000	100.592	0.000
HORIZ. STAB.	10.890	0.000	-382.514	0.000	-8371.051	0.000
VERT. STAB.						
FIN NO. 1	-5.714	0.000	0.000	0.000	20.048	-36.664
FIN NO. 2	-5.714	0.000	0.000	0.000	20.048	36.662
TOTAL	-11.427	0.000	0.000	0.000	40.095	-0.002
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-10.218	0.000	0.000	0.000	22.491	-164.339
RIGHT ENG	-10.218	0.000	0.000	0.000	22.491	164.339
TOTAL	-20.436	0.000	0.000	0.000	44.983	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	1168.605	0.000	-12274.296	0.000	862.482	-0.002
ROTOR						
LEFT ROTOR	798.130	39.295	-218.205	7761.376	-575.376	12943.556
RIGHT ROTOR	798.130	-39.295	-218.205	-7761.376	-575.376	-12943.556
HUB SPINNER	-95.926	0.000	-19.920	0.000	301.169	0.000
TOTAL ROTOR	1500.335	0.000	-456.330	0.000	-849.584	0.000
TOTAL AIRCRAFT (BODY AXIS)	2668.940	0.000	-12730.626	0.000	12.898	-0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	2.163	0.000	-7.093	0.000	12.898	-0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =140.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.3609	0.0000	-0.4302	0.0000	-0.1877	0.0000
	ROTOR	0.0000	-0.0934	0.0000	-0.1064	0.0000	-0.1524	0.0000
	AIRFRM	0.0000	-0.2675	0.0000	-0.3238	0.0000	-0.0353	0.0000
Q	TOTAL	0.8021	0.0000	-5.7385	0.0000	-0.7858	0.0000	0.3072
	ROTOR	0.6345	0.0000	-3.8389	0.0000	0.1776	0.0000	0.3072
	AIRFRM	0.1676	0.0000	-1.8996	0.0000	-0.9634	0.0000	0.0000
R	TOTAL	0.0000	4.9506	0.0000	-0.0613	0.0000	-0.5712	0.0000
	ROTOR	0.0000	3.7745	0.0000	-0.1638	0.0000	-0.3977	0.0000
	AIRFRM	0.0000	1.1761	0.0000	0.1026	0.0000	-0.1735	0.0000
U	TOTAL	-0.2658	0.0000	-0.2043	0.0000	0.0199	0.0000	-0.5288
	ROTOR	-0.2659	0.0000	-0.0063	0.0000	0.0121	0.0000	-0.5288
	AIRFRM	0.0001	0.0000	-0.1980	0.0000	0.0078	0.0000	0.0000
V	TOTAL	0.0000	-0.1237	0.0000	-0.0041	0.0000	0.0030	0.0000
	ROTOR	0.0000	-0.0281	0.0000	-0.0003	0.0000	-0.0014	0.0000
	AIRFRM	0.0000	-0.0955	0.0000	-0.0038	0.0000	0.0044	0.0000
W	TOTAL	0.1583	0.0000	-0.5442	0.0000	-0.0280	0.0000	0.0120
	ROTOR	0.0164	0.0000	-0.0288	0.0000	0.0030	0.0000	0.0120
	AIRFRM	0.1418	0.0000	-0.5154	0.0000	-0.0310	0.0000	0.0000
RPM	TOTAL	1.2532	0.0000	0.1892	0.0000	-0.0627	0.0000	2.8158
	ROTOR	1.2888	0.0000	0.0051	0.0000	-0.0575	0.0000	2.8158
	AIRFRM	-0.0356	0.0000	0.1842	0.0000	-0.0052	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6339
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6339
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.7648	0.0000	0.3353	0.0000	-0.1259	0.0000	6.0256
	ROTOR	2.8694	0.0000	-0.1378	0.0000	-0.1131	0.0000	6.0256
	AIRFRM	-0.1046	0.0000	0.4730	0.0000	-0.0129	0.0000	0.0000
XLN	TOTAL	0.0814	0.0000	-0.9989	0.0000	-0.4367	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0814	0.0000	-0.9989	0.0000	-0.4367	0.0000	0.0000
XLT	TOTAL	0.0000	0.0008	0.0000	0.1216	0.0000	0.0296	0.0000
	ROTOR	0.0000	0.0008	0.0000	0.0117	0.0000	0.0335	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1099	0.0000	-0.0039	0.0000
XPD	TOTAL	0.0000	-0.7430	0.0000	-0.0207	0.0000	0.1012	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-0.7430	0.0000	-0.0207	0.0000	0.1012	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

EARTH REFERENCE

		UE	VE	WE
RATE	(FPS)	270.0	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.2414E-04	-.1418E-06	0.4658E-06

BODY REFERENCE

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	267.4	0.0000E+00	37.51	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.7028E-07	-.8916E-03	-.8059E-06

ATMOSPHERIC CONDITIONS

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	12001.49
PRESSURE ALT. (FT)	12000.00
AMBIENT TEMP (DEG-R)	264.39
OUTSIDE AIR TEMP (DEG-C)	-8.77
AIR DENSITY (SLUGS/FT3)	0.1648E-02
THETES (ND)	0.91750
DELSTD (ND)	0.63599
SIGMA PRIME (ND)	0.69318

FLIGHT PATH CONDITIONS

CAL. AIRSPEED	(KNOTS)	134.28
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		60.08
ANGLE OF ATTACK	(DEG)	7.985
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	7.985
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS

	(+)	(IN)	(PER)
COLL	(UP)	5.1187	51.19
LONG	(FWD)	4.3870	45.70
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE

	POWER (SHP)	TORQUE (FT-LBS)
LEFT	424.5	4312.
RIGHT	424.5	4312.
ENGINE	466.4	

BLADE

	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	8.024	728.6	0.6814
RIGHT	8.024	728.6	0.6814

SWASH PLATE ANGLE (DEG)

	LEFT ROTOR	RIGHT ROTOR
THETA0	63.8236	63.8236
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)

ELEVATOR	-1.9556
AILERON	0.0000
RUDDER	0.0000

ROTOR — FLAPPING

	AO (DEG)	LONG (DEG)	LAT (DEG)
LEFT	1.1966	0.4753	0.3500
RIGHT	1.1966	0.4753	0.3500

ROTOR — FORCES - MAST AXIS

	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	697.68	183.77	-39.91	-18.84
RIGHT	697.68	183.77	-39.91	-18.84

ROTOR

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8077	0.0554	1.6563	0.3976	0.000931	0.001884	0.013835
RIGHT	0.8077	0.0554	1.6563	0.3976	0.000931	0.001884	0.013835

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03349	0.01193	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03349	0.01193				

TIME USED FOR THIS TRIM = 0.0213 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-75.575	0.000	-887.607	0.000	5571.600	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	737.873	0.000	-11189.174	0.000	3789.684	0.000
TOTAL	737.873	0.000	-11189.174	0.000	3789.684	0.000
ENGINE PYLONS	-60.668	0.000	-8.427	0.000	132.295	0.000
HORIZ. STAB.	-15.068	0.000	-404.235	0.000	-8781.251	0.000
VERT. STAB.						
FIN NO. 1	-8.673	0.000	0.000	0.000	30.431	-55.652
FIN NO. 2	-8.673	0.000	0.000	0.000	30.431	55.652
TOTAL	-17.346	0.000	0.000	0.000	60.862	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-18.841	0.000	0.000	0.000	41.473	-303.029
RIGHT ENG	-18.841	0.000	0.000	0.000	41.473	303.029
TOTAL	-37.682	0.000	0.000	0.000	82.945	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	531.533	0.000	-12489.441	0.000	856.135	-0.001
ROTOR						
LEFT ROTOR	698.266	36.698	-183.742	7363.327	-601.208	11372.525
RIGHT ROTOR	698.266	-36.698	-183.742	-7363.327	-601.208	-11372.525
HUB SPINNER	-122.198	0.000	-17.036	0.000	345.964	0.000
TOTAL ROTOR	1274.334	0.000	-384.519	0.000	-856.452	0.000
TOTAL AIRCRAFT (BODY AXIS)	1805.867	0.000	-12873.960	0.000	-0.317	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.010	0.000	-0.002	0.000	-0.317	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.4598	0.0000	-0.4793	0.0000	-0.1709	0.0000
	ROTOR	0.0000	-0.1007	0.0000	-0.1277	0.0000	-0.1632	0.0000
	AIRFRM	0.0000	-0.3591	0.0000	-0.3516	0.0000	-0.0077	0.0000
Q	TOTAL	0.6937	0.0000	-6.6603	0.0000	-0.8889	0.0000	0.4549
	ROTOR	0.6437	0.0000	-4.5039	0.0000	0.2325	0.0000	0.4549
	AIRFRM	0.0499	0.0000	-2.1564	0.0000	-1.1214	0.0000	0.0000
R	TOTAL	0.0000	6.0435	0.0000	-0.0641	0.0000	-0.5933	0.0000
	ROTOR	0.0000	4.4590	0.0000	-0.1785	0.0000	-0.3643	0.0000
	AIRFRM	0.0000	1.5845	0.0000	0.1144	0.0000	-0.2290	0.0000
U	TOTAL	-0.2656	0.0000	-0.2149	0.0000	0.0183	0.0000	-0.6093
	ROTOR	-0.2641	0.0000	-0.0063	0.0000	0.0120	0.0000	-0.6093
	AIRFRM	-0.0015	0.0000	-0.2087	0.0000	0.0063	0.0000	0.0000
V	TOTAL	0.0000	-0.1519	0.0000	-0.0046	0.0000	0.0043	0.0000
	ROTOR	0.0000	-0.0329	0.0000	-0.0004	0.0000	-0.0016	0.0000
	AIRFRM	0.0000	-0.1190	0.0000	-0.0042	0.0000	0.0059	0.0000
W	TOTAL	0.1374	0.0000	-0.6442	0.0000	-0.0215	0.0000	0.0110
	ROTOR	0.0138	0.0000	-0.0337	0.0000	0.0038	0.0000	0.0110
	AIRFRM	0.1235	0.0000	-0.6105	0.0000	-0.0252	0.0000	0.0000
RPM	TOTAL	1.4055	0.0000	0.2779	0.0000	-0.0770	0.0000	3.5937
	ROTOR	1.4439	0.0000	0.0142	0.0000	-0.0649	0.0000	3.5937
	AIRFRM	-0.0384	0.0000	0.2637	0.0000	-0.0121	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6592
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6592
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.9241	0.0000	0.5169	0.0000	-0.1511	0.0000	7.2950
	ROTOR	3.0255	0.0000	-0.1006	0.0000	-0.1232	0.0000	7.2950
	AIRFRM	-0.1013	0.0000	0.6175	0.0000	-0.0278	0.0000	0.0000
XLN	TOTAL	0.0371	0.0000	-1.3199	0.0000	-0.5736	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0371	0.0000	-1.3199	0.0000	-0.5736	0.0000	0.0000
XLT	TOTAL	0.0000	0.0017	0.0000	0.1893	0.0000	0.0283	0.0000
	ROTOR	0.0000	0.0017	0.0000	0.0139	0.0000	0.0354	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1754	0.0000	-0.0070	0.0000
XPD	TOTAL	0.0000	-0.9651	0.0000	-0.0269	0.0000	0.1315	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-0.9651	0.0000	-0.0269	0.0000	0.1315	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		----- EARTH REFERENCE ----- UE	VE	WE
RATE	(FPS)	303.8	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.5137E-05	0.1032E-06	-.1867E-04

	---------- BODY REFERENCE ---------- UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	302.4	0.2476E-05	28.90	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.8178E-05	0.4279E-03	0.1812E-04

----- ATMOSPHERIC CONDITIONS -----	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	12001.49
PRESSURE ALT. (FT)	12000.00
AMBIENT TEMP (DEG-R)	264.39
OUTSIDE AIR TEMP (DEG-C)	-8.77
AIR DENSITY (SLUGS/FT3)	0.1648E-02
THETES (ND)	0.91750
DELSTD (ND)	0.63599
SIGMA PRIME (ND)	0.69318

----- FLIGHT PATH CONDITIONS -----		
CAL. AIRSPEED	(KNOTS)	151.37
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	76.04
ANGLE OF ATTACK	(DEG)	5.458
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	5.458
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)		----- CENTER OF GRAVITY ----- (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

----- CONTROL DISPLACEMENTS -----	(+)	(IN)	(PER)
COLL	(UP)	5.5850	55.85
LONG	(FWD)	4.8015	50.02
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ----------	POWER (SHP)	TORQUE (FT-LBS)	---------- BLADE ---------- GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	480.4	4880.	11.02	741.8	0.6937
RIGHT	480.4	4880.	11.02	741.8	0.6937
ENGINE	526.5				

----- SWASH PLATE ANGLE (DEG) ----	LEFT ROTOR	RIGHT ROTOR
THETA0	66.8169	66.8169
B1	1.5000	1.5000
A1	0.0000	0.0000

------- SURFACE POSITIONS ------- (DEG)	
ELEVATOR	0.0069
AILERON	0.0000
RUDDER	0.0000

---------- ROTOR ---------- FLAPPING ----------	AO (DEG)	LONG (DEG)	LAT (DEG)	---- FORCES - MAST AXIS ------ THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	1.1956	0.0583	0.1720	694.84	142.53	-38.93	-25.65
RIGHT	1.1956	0.0583	0.1720	694.84	142.53	-38.93	-25.65

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7996	0.0427	1.4687	0.4490	0.001054	0.001876	0.013834
RIGHT	0.7996	0.0427	1.4687	0.4490	0.001054	0.001876	0.013834

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.03102	0.01287	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.03102	0.01287				

TIME USED FOR THIS TRIM = 0.0188 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-137.721	0.000	-942.663	0.000	3358.256	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	322.867	0.000	-11381.759	0.011	4295.597	0.000
TOTAL	322.867	0.000	-11381.759	0.011	4295.597	0.000
ENGINE PYLONS	-76.866	0.000	-7.287	0.000	168.118	0.000
HORIZ. STAB.	-34.076	0.000	-309.739	0.000	-6673.270	0.000
VERT. STAB.						
FIN NO. 1	-11.867	0.000	0.000	-0.002	41.637	-76.136
FIN NO. 2	-11.867	0.000	0.000	-0.002	41.637	76.158
TOTAL	-23.734	-0.001	0.000	-0.003	83.275	0.022
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-25.652	0.000	0.000	0.000	56.465	-412.572
RIGHT ENG	-25.652	0.000	0.000	0.000	56.465	412.572
TOTAL	-51.304	0.000	0.000	0.000	112.929	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-0.834	-0.001	-12641.447	0.007	1344.906	0.021
ROTOR						
LEFT ROTOR	695.418	36.438	-142.505	7264.164	-874.376	11366.999
RIGHT ROTOR	695.418	-36.438	-142.505	-7264.164	-874.376	-11366.999
HUB SPINNER	-153.562	0.000	-14.601	0.000	403.998	0.000
TOTAL ROTOR	1237.275	0.000	-299.612	0.000	-1344.754	0.000
TOTAL AIRCRAFT (BODY AXIS)	1236.440	-0.001	-12941.059	0.007	0.152	0.021
TOTAL AIRCRAFT (INERTIAL AXIS)	0.001	0.000	0.008	0.007	0.152	0.021

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.5449	0.0000	-0.5501	0.0000	-0.1610	0.0000
	ROTOR	0.0000	-0.1028	0.0000	-0.1500	0.0000	-0.1741	0.0000
	AIRFRM	0.0000	-0.4421	0.0000	-0.4001	0.0000	0.0131	0.0000
Q	TOTAL	0.6197	0.0000	-7.5250	0.0000	-0.9937	0.0000	0.5942
	ROTOR	0.6510	0.0000	-5.1026	0.0000	0.2815	0.0000	0.5942
	AIRFRM	-0.0312	0.0000	-2.4224	0.0000	-1.2752	0.0000	0.0000
R	TOTAL	0.0000	7.0298	0.0000	-0.0703	0.0000	-0.6107	0.0000
	ROTOR	0.0000	5.0755	0.0000	-0.1939	0.0000	-0.3310	0.0000
	AIRFRM	0.0000	1.9543	0.0000	0.1236	0.0000	-0.2797	0.0000
U	TOTAL	-0.2641	0.0000	-0.2232	0.0000	0.0180	0.0000	-0.6749
	ROTOR	-0.2587	0.0000	-0.0062	0.0000	0.0118	0.0000	-0.6749
	AIRFRM	-0.0054	0.0000	-0.2170	0.0000	0.0062	0.0000	0.0000
V	TOTAL	0.0000	-0.1792	0.0000	-0.0052	0.0000	0.0055	0.0000
	ROTOR	0.0000	-0.0379	0.0000	-0.0006	0.0000	-0.0018	0.0000
	AIRFRM	0.0000	-0.1413	0.0000	-0.0046	0.0000	0.0073	0.0000
W	TOTAL	0.1116	0.0000	-0.7219	0.0000	-0.0174	0.0000	0.0103
	ROTOR	0.0117	0.0000	-0.0387	0.0000	0.0045	0.0000	0.0103
	AIRFRM	0.0998	0.0000	-0.6833	0.0000	-0.0218	0.0000	0.0000
RPM	TOTAL	1.5579	0.0000	0.4142	0.0000	-0.0905	0.0000	4.4470
	ROTOR	1.5889	0.0000	0.0241	0.0000	-0.0719	0.0000	4.4470
	AIRFRM	-0.0310	0.0000	0.3901	0.0000	-0.0186	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.7196
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.7196
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.0918	0.0000	0.7953	0.0000	-0.1735	0.0000	8.6347
	ROTOR	3.1704	0.0000	-0.0610	0.0000	-0.1331	0.0000	8.6347
	AIRFRM	-0.0786	0.0000	0.8563	0.0000	-0.0404	0.0000	0.0000
XLN	TOTAL	-0.0003	0.0000	-1.6852	0.0000	-0.7300	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0003	0.0000	-1.6852	0.0000	-0.7300	0.0000	0.0000
XLT	TOTAL	0.0000	0.0023	0.0000	0.2349	0.0000	0.0347	0.0000
	ROTOR	0.0000	0.0023	0.0000	0.0162	0.0000	0.0372	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2187	0.0000	-0.0025	0.0000
XPD	TOTAL	0.0000	-1.2146	0.0000	-0.0338	0.0000	0.1655	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.2146	0.0000	-0.0338	0.0000	0.1655	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		----- EARTH REFERENCE ----- UE	VE	WE
RATE	(FPS)	337.6	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.1501E-02	-.2216E-06	-.1989E-02

	---------- BODY REFERENCE ---------- UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	336.8	0.0000E+00	21.93	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.9088E-08	0.4409E-01	-.1250E-05

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	12001.49
PRESSURE ALT. (FT)	12000.00
AMBIENT TEMP (DEG-R)	264.39
OUTSIDE AIR TEMP (DEG-C)	-8.77
AIR DENSITY (SLUGS/FT3)	0.1648E-02
THETES (ND)	0.91750
DELSTD (ND)	0.63599
SIGMA PRIME (ND)	0.69318

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	168.57
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	93.87
ANGLE OF ATTACK	(DEG)	3.725
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	3.725
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY ----- (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	6.1756	61.76
LONG	(FWD)	5.0661	52.77
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	552.9	5617.	13.79	756.3	0.7072
RIGHT	552.9	5617.	13.79	756.3	0.7072
ENGINE	604.5				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETA0	69.5934	69.5934
B1	1.5000	1.5000
A1	0.0000	0.0000

---------- ROTOR ----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.2049	-0.3727	0.0001	719.87	95.92	-40.24	-32.12
RIGHT	1.2049	-0.3727	0.0001	719.87	95.92	-40.24	-32.12

------- SURFACE POSITIONS -------

	(DEG)
ELEVATOR	1.2599
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.7997	0.0324	1.3701	0.4997	0.001213	0.001943	0.013806
RIGHT	0.7997	0.0324	1.3701	0.4997	0.001213	0.001943	0.013806

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02831	0.01363	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02831	0.01363				

TIME USED FOR THIS TRIM = 0.0155 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-196.077	0.000	-1010.053	0.000	1012.202	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	24.921	0.000	-11563.573	0.000	4533.604	0.000
TOTAL	24.921	0.000	-11563.573	0.000	4533.604	0.000
ENGINE PYLONS	-94.893	0.000	-6.139	0.000	207.968	0.000
HORIZ. STAB.	-45.551	0.000	-187.852	0.000	-3986.248	0.000
VERT. STAB.						
FIN NO. 1	-15.342	0.000	0.000	0.000	53.830	-98.444
FIN NO. 2	-15.342	0.000	0.000	0.000	53.830	98.444
TOTAL	-30.684	0.000	0.000	0.000	107.659	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-32.119	0.000	0.000	0.000	70.699	-516.581
RIGHT ENG	-32.119	0.000	0.000	0.000	70.699	516.581
TOTAL	-64.238	0.000	0.000	0.000	141.398	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-406.522	0.000	-12767.618	0.000	2016.583	-0.001
ROTOR						
LEFT ROTOR	720.459	38.556	-95.902	7252.031	-1236.355	11821.729
RIGHT ROTOR	720.459	-38.556	-95.902	-7252.031	-1236.355	-11821.729
HUB SPINNER	-189.150	0.000	-12.266	0.000	471.785	0.000
TOTAL ROTOR	1251.767	0.000	-204.070	0.000	-2000.925	0.000
TOTAL AIRCRAFT (BODY AXIS)	845.245	0.000	-12971.688	0.000	15.658	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.553	0.000	0.842	0.000	15.658	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6233	0.0000	-0.6354	0.0000	-0.1531	0.0000
	ROTOR	0.0000	-0.1021	0.0000	-0.1728	0.0000	-0.1842	0.0000
	AIRFRM	0.0000	-0.5212	0.0000	-0.4626	0.0000	0.0311	0.0000
Q	TOTAL	0.5469	0.0000	-8.4144	0.0000	-1.1010	0.0000	0.7158
	ROTOR	0.6579	0.0000	-5.6781	0.0000	0.3286	0.0000	0.7158
	AIRFRM	-0.1110	0.0000	-2.7362	0.0000	-1.4296	0.0000	0.0000
R	TOTAL	0.0000	7.9688	0.0000	-0.0758	0.0000	-0.6260	0.0000
	ROTOR	0.0000	5.6632	0.0000	-0.2082	0.0000	-0.2983	0.0000
	AIRFRM	0.0000	2.3055	0.0000	0.1324	0.0000	-0.3278	0.0000
U	TOTAL	-0.2596	0.0000	-0.2356	0.0000	0.0184	0.0000	-0.7317
	ROTOR	-0.2515	0.0000	-0.0062	0.0000	0.0115	0.0000	-0.7317
	AIRFRM	-0.0081	0.0000	-0.2293	0.0000	0.0069	0.0000	0.0000
V	TOTAL	0.0000	-0.2059	0.0000	-0.0058	0.0000	0.0067	0.0000
	ROTOR	0.0000	-0.0431	0.0000	-0.0008	0.0000	-0.0019	0.0000
	AIRFRM	0.0000	-0.1628	0.0000	-0.0050	0.0000	0.0086	0.0000
W	TOTAL	0.0949	0.0000	-0.8231	0.0000	-0.0183	0.0000	0.0093
	ROTOR	0.0100	0.0000	-0.0436	0.0000	0.0051	0.0000	0.0093
	AIRFRM	0.0849	0.0000	-0.7795	0.0000	-0.0234	0.0000	0.0000
RPM	TOTAL	1.6827	0.0000	0.5952	0.0000	-0.1048	0.0000	5.3418
	ROTOR	1.7181	0.0000	0.0353	0.0000	-0.0784	0.0000	5.3418
	AIRFRM	-0.0354	0.0000	0.5599	0.0000	-0.0264	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.8189
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.8189
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.2243	0.0000	1.1563	0.0000	-0.1979	0.0000	10.0389
	ROTOR	3.3085	0.0000	-0.0182	0.0000	-0.1430	0.0000	10.0389
	AIRFRM	-0.0842	0.0000	1.1745	0.0000	-0.0549	0.0000	0.0000
XLN	TOTAL	-0.0233	0.0000	-2.0972	0.0000	-0.9073	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0233	0.0000	-2.0972	0.0000	-0.9073	0.0000	0.0000
XLT	TOTAL	0.0000	0.0030	0.0000	0.2868	0.0000	0.0419	0.0000
	ROTOR	0.0000	0.0030	0.0000	0.0187	0.0000	0.0390	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2681	0.0000	0.0028	0.0000
XPD	TOTAL	0.0000	-1.4912	0.0000	-0.0415	0.0000	0.2032	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.4912	0.0000	-0.0415	0.0000	0.2032	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE		
		UE	VE	WE
RATE	(FPS)	371.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.5059E-02	-.2681E-06	-.6175E-01

	BODY REFERENCE				
	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	371.0	0.0000E+00	16.15	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.5282E-07	-.4660E-01	-.1511E-05

ATMOSPHERIC CONDITIONS		
ALTITUDE	(FT)	5000.00
DENSITY ALT.	(FT)	12001.49
PRESSURE ALT.	(FT)	12000.00
AMBIENT TEMP	(DEG-R)	264.39
OUTSIDE AIR TEMP	(DEG-C)	-8.77
AIR DENSITY	(SLUGS/FT3)	0.1648E-02
THETES	(ND)	0.91750
DELSTD	(ND)	0.63599
SIGMA PRIME	(ND)	0.69318

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED	(KNOTS)	185.87
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	113.58
ANGLE OF ATTACK	(DEG)	2.493
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	2.493
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	6.8933	68.93
LONG	(FWD)	5.2475	54.66
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	650.4	6607.	16.39	771.9	0.7218
RIGHT	650.4	6607.	16.39	771.9	0.7218
ENGINE	709.3				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	72.1929	72.1929
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR — FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2261	-0.8127	-0.1793	776.62	43.73	-43.99	-38.28
RIGHT	1.2261	-0.8127	-0.1793	776.62	43.73	-43.99	-38.28

SURFACE POSITIONS (DEG)	
ELEVATOR	2.1189
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8068	0.0239	1.3431	0.5501	0.001427	0.002097	0.013754
RIGHT	0.8068	0.0239	1.3431	0.5501	0.001427	0.002097	0.013754

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02536	0.01426	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02536	0.01426				

TIME USED FOR THIS TRIM = 0.0123 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-260.602	0.000	-1089.868	0.000	-1471.875	-0.002
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-221.474	0.000	-11724.681	0.000	4619.403	0.000
TOTAL	-221.474	0.000	-11724.681	0.000	4619.403	0.000
ENGINE PYLONS	-114.794	0.000	-4.970	0.000	251.945	0.000
HORIZ. STAB.	-51.684	0.000	-45.979	0.000	-876.315	0.000
VERT. STAB.						
FIN NO. 1	-19.159	0.000	0.000	0.000	67.222	-122.935
FIN NO. 2	-19.159	0.000	0.000	0.000	67.222	122.935
TOTAL	-38.318	0.000	0.000	0.000	134.443	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-38.284	0.000	0.000	0.000	84.270	-615.740
RIGHT ENG	-38.284	0.000	0.000	0.000	84.270	615.740
TOTAL	-76.569	0.000	0.000	0.000	168.540	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-763.439	0.000	-12865.497	0.000	2826.143	-0.002
ROTOR						
LEFT ROTOR	777.270	43.218	-43.718	7408.858	-1695.479	12803.206
RIGHT ROTOR	777.270	-43.218	-43.718	-7408.858	-1695.479	-12803.206
HUB SPINNER	-228.700	0.000	-9.922	0.000	548.246	0.000
TOTAL ROTOR	1325.840	0.000	-97.359	0.000	-2842.713	0.000
TOTAL AIRCRAFT (BODY AXIS)	562.401	0.000	-12962.855	0.000	-16.570	-0.002
TOTAL AIRCRAFT (INERTIAL AXIS)	-3.122	0.000	24.838	0.000	-16.570	-0.002

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

********** *** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE *** *** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 *** *** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG *** **********

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6989	0.0000	-0.7106	0.0000	-0.1455	0.0000
	ROTOR	0.0000	-0.0993	0.0000	-0.1966	0.0000	-0.1941	0.0000
	AIRFRM	0.0000	-0.5996	0.0000	-0.5140	0.0000	0.0486	0.0000
Q	TOTAL	0.5081	0.0000	-9.3900	0.0000	-1.2108	0.0000	0.8212
	ROTOR	0.6629	0.0000	-6.2315	0.0000	0.3743	0.0000	0.8212
	AIRFRM	-0.1548	0.0000	-3.1585	0.0000	-1.5851	0.0000	0.0000
R	TOTAL	0.0000	8.8771	0.0000	-0.0796	0.0000	-0.6415	0.0000
	ROTOR	0.0000	6.2238	0.0000	-0.2221	0.0000	-0.2663	0.0000
	AIRFRM	0.0000	2.6533	0.0000	0.1426	0.0000	-0.3753	0.0000
U	TOTAL	-0.2566	0.0000	-0.2497	0.0000	0.0190	0.0000	-0.7848
	ROTOR	-0.2446	0.0000	-0.0063	0.0000	0.0112	0.0000	-0.7848
	AIRFRM	-0.0119	0.0000	-0.2434	0.0000	0.0078	0.0000	0.0000
V	TOTAL	0.0000	-0.2328	0.0000	-0.0065	0.0000	0.0079	0.0000
	ROTOR	0.0000	-0.0486	0.0000	-0.0010	0.0000	-0.0021	0.0000
	AIRFRM	0.0000	-0.1842	0.0000	-0.0055	0.0000	0.0100	0.0000
W	TOTAL	0.0744	0.0000	-0.9170	0.0000	-0.0191	0.0000	0.0088
	ROTOR	0.0086	0.0000	-0.0486	0.0000	0.0058	0.0000	0.0088
	AIRFRM	0.0658	0.0000	-0.8683	0.0000	-0.0249	0.0000	0.0000
RPM	TOTAL	1.8222	0.0000	0.7954	0.0000	-0.1212	0.0000	6.3157
	ROTOR	1.8454	0.0000	0.0480	0.0000	-0.0850	0.0000	6.3157
	AIRFRM	-0.0233	0.0000	0.7474	0.0000	-0.0363	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.0540
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.0540
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.4078	0.0000	1.5501	0.0000	-0.2274	0.0000	11.5923
	ROTOR	3.4650	0.0000	0.0279	0.0000	-0.1540	0.0000	11.5923
	AIRFRM	-0.0572	0.0000	1.5222	0.0000	-0.0735	0.0000	0.0000
XLN	TOTAL	-0.0477	0.0000	-2.5575	0.0000	-1.1056	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0477	0.0000	-2.5575	0.0000	-1.1056	0.0000	0.0000
XLT	TOTAL	0.0000	0.0039	0.0000	0.3448	0.0000	0.0500	0.0000
	ROTOR	0.0000	0.0039	0.0000	0.0214	0.0000	0.0409	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3234	0.0000	0.0091	0.0000
XPD	TOTAL	0.0000	-1.7941	0.0000	-0.0499	0.0000	0.2445	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.7941	0.0000	-0.0499	0.0000	0.2445	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	405.1	0.1421E-13	0.0000E+00
ACCEL	(FPS2)	0.1775E-03	0.6434E-06	-.4463E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	404.9	0.2118E-06	11.37	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.1951E-04	0.4523E-03	0.4306E-04

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	12001.49
PRESSURE ALT. (FT)	12000.00
AMBIENT TEMP (DEG-R)	264.39
OUTSIDE AIR TEMP (DEG-C)	-8.77
AIR DENSITY (SLUGS/FT3)	0.1648E-02
THETES (ND)	0.91750
DELSTD (ND)	0.63599
SIGMA PRIME (ND)	0.69318

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		203.28
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		135.17
ANGLE OF ATTACK (DEG)		1.609
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		0.000
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS (+)		(IN)	(PER)
COLL	(UP)	7.6521	76.52
LONG	(FWD)	5.3744	55.98
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	768.0	7802.	18.81	788.7	0.7375
RIGHT	768.0	7802.	18.81	788.7	0.7375
ENGINE	835.8				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	74.6142	74.6142
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	2.7198
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2535	-1.2482	-0.3724	850.17	-12.63	-50.17	-44.25
RIGHT	1.2535	-1.2482	-0.3724	850.17	-12.63	-50.17	-44.25

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8160	0.0168	1.3458	0.6003	0.001685	0.002295	0.013697
RIGHT	0.8160	0.0168	1.3458	0.6003	0.001685	0.002295	0.013697

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02220	0.01478	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02220	0.01478				

TIME USED FOR THIS TRIM = 0.0153 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-325.989	0.000	-1183.730	0.000	-4058.898	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-408.437	0.000	-11937.770	0.000	4581.114	0.000
TOTAL	-408.437	0.000	-11937.770	0.000	4581.114	0.000
ENGINE PYLONS	-136.561	0.000	-3.815	0.000	300.030	0.000
HORIZ. STAB.	-58.611	0.000	112.831	0.000	2605.023	0.000
VERT. STAB.						
FIN NO. 1	-23.309	0.000	0.000	0.000	81.783	-149.565
FIN NO. 2	-23.309	0.000	0.000	0.000	81.783	149.565
TOTAL	-46.618	0.000	0.000	0.000	163.566	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-44.248	0.000	0.000	0.000	97.397	-711.654
RIGHT ENG	-44.248	0.000	0.000	0.000	97.397	711.654
TOTAL	-88.496	0.000	0.000	0.000	194.794	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1064.712	0.000	-13012.484	0.000	3785.629	0.000
ROTOR						
LEFT ROTOR	850.916	50.381	12.624	7708.830	-2209.398	14071.196
RIGHT ROTOR	850.916	-50.381	12.624	-7708.830	-2209.398	-14071.196
HUB SPINNER	-272.073	0.000	-7.616	0.000	633.295	0.000
TOTAL ROTOR	1429.759	0.000	17.633	0.000	-3785.501	0.000
TOTAL AIRCRAFT (BODY AXIS)	365.047	0.000	-12994.852	-0.001	0.128	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.080	0.000	0.023	-0.001	0.128	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.7728	0.0000	-0.7887	0.0000	-0.1387	0.0000
	ROTOR	0.0000	-0.0952	0.0000	-0.2213	0.0000	-0.2037	0.0000
	AIRFRM	0.0000	-0.6776	0.0000	-0.5675	0.0000	0.0651	0.0000
Q	TOTAL	0.6122	0.0000	-10.4526	0.0000	-1.3298	0.0000	0.9142
	ROTOR	0.6669	0.0000	-6.7729	0.0000	0.4195	0.0000	0.9142
	AIRFRM	-0.0547	0.0000	-3.6797	0.0000	-1.7493	0.0000	0.0000
R	TOTAL	0.0000	9.7665	0.0000	-0.0823	0.0000	-0.6577	0.0000
	ROTOR	0.0000	6.7675	0.0000	-0.2356	0.0000	-0.2353	0.0000
	AIRFRM	0.0000	2.9991	0.0000	0.1533	0.0000	-0.4224	0.0000
U	TOTAL	-0.2540	0.0000	-0.2651	0.0000	0.0199	0.0000	-0.8312
	ROTOR	-0.2376	0.0000	-0.0063	0.0000	0.0109	0.0000	-0.8312
	AIRFRM	-0.0164	0.0000	-0.2588	0.0000	0.0090	0.0000	0.0000
V	TOTAL	0.0000	-0.2598	0.0000	-0.0072	0.0000	0.0091	0.0000
	ROTOR	0.0000	-0.0543	0.0000	-0.0013	0.0000	-0.0023	0.0000
	AIRFRM	0.0000	-0.2055	0.0000	-0.0059	0.0000	0.0115	0.0000
W	TOTAL	0.0530	0.0000	-1.0111	0.0000	-0.0199	0.0000	0.0089
	ROTOR	0.0075	0.0000	-0.0538	0.0000	0.0064	0.0000	0.0089
	AIRFRM	0.0454	0.0000	-0.9574	0.0000	-0.0264	0.0000	0.0000
RPM	TOTAL	1.9610	0.0000	1.0235	0.0000	-0.1394	0.0000	7.3472
	ROTOR	1.9656	0.0000	0.0619	0.0000	-0.0913	0.0000	7.3472
	AIRFRM	-0.0046	0.0000	0.9616	0.0000	-0.0481	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.8232
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.8232
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.6099	0.0000	2.0038	0.0000	-0.2615	0.0000	13.2752
	ROTOR	3.6293	0.0000	0.0766	0.0000	-0.1655	0.0000	13.2752
	AIRFRM	-0.0193	0.0000	1.9272	0.0000	-0.0960	0.0000	0.0000
XLN	TOTAL	-0.0733	0.0000	-3.0670	0.0000	-1.3250	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0733	0.0000	-3.0670	0.0000	-1.3250	0.0000	0.0000
XLT	TOTAL	0.0000	0.0050	0.0000	0.4088	0.0000	0.0588	0.0000
	ROTOR	0.0000	0.0050	0.0000	0.0244	0.0000	0.0429	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3844	0.0000	0.0159	0.0000
XPD	TOTAL	0.0000	-2.1231	0.0000	-0.0591	0.0000	0.2893	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.1231	0.0000	-0.0591	0.0000	0.2893	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	438.8	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.1477E-03	0.2846E-07	-.8379E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	438.8	0.6635E-08	7.124	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.2438E-08	0.1081E-01	-.3905E-10

ATMOSPHERIC CONDITIONS		FLIGHT PATH CONDITIONS			INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
ALTITUDE (FT)	5000.00	CAL. AIRSPEED (KNOTS)	220.82					
DENSITY ALT. (FT)	12001.49	RATE OF DECENT (FPS)	0.00					
PRESSURE ALT. (FT)	12000.00	G-LEVEL (G S)	1.00	IXX	0.5095E+05	S.L.	298.2	
AMBIENT TEMP (DEG-R)	264.39	DYN PRES (SLUGS/FT-SEC2)	158.64	IXZ	1076.	B.L.	0.0000E+00	
OUTSIDE AIR TEMP (DEG-C)	-8.77	ANGLE OF ATTACK (DEG)	0.930	IYY	0.2035E+05	W.L.	73.59	
AIR DENSITY (SLUGS/FT3)	0.1648E-02	FLIGHT PATH ANGLE (DEG)	0.000	IZZ	0.6717E+05			
		SIDESLIP ANGLE (DEG)	0.000					
THETES (ND)	0.91750	ROLL ANGLE (DEG)	0.000					
DELSTD (ND)	0.63599	PITCH ANGLE (DEG)	0.930					
SIGMA PRIME (ND)	0.69318	YAW ANGLE (DEG)	0.000					

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	8.3674	83.67
LONG	(FWD)	5.4740	57.02
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	902.5	9169.	21.06	806.6	0.7542
RIGHT	902.5	9169.	21.06	806.6	0.7542
ENGINE	980.4				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	76.8635	76.8635
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR - FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2839	-1.6974	-0.5929	931.86	-75.79	-58.90	-50.31
RIGHT	1.2839	-1.6974	-0.5929	931.86	-75.79	-58.90	-50.31

SURFACE POSITIONS (DEG)	
ELEVATOR	3.1913
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8246	0.0105	1.3581	0.6503	0.001980	0.002516	0.013647
RIGHT	0.8246	0.0105	1.3581	0.6503	0.001980	0.002516	0.013647

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01883	0.01525	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01883	0.01525				

TIME USED FOR THIS TRIM = 0.0155 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-394.133	0.000	-1287.101	0.000	-6843.246	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-559.544	0.000	-12144.125	0.000	4427.951	0.000
TOTAL	-559.544	0.000	-12144.125	0.000	4427.951	0.000
ENGINE PYLONS	-160.196	0.000	-2.588	0.000	352.234	0.000
HORIZ. STAB.	-65.169	0.000	289.470	0.000	6474.396	0.000
VERT. STAB.						
FIN NO. 1	-27.813	0.000	0.000	0.000	97.587	-178.467
FIN NO. 2	-27.813	0.000	0.000	0.000	97.587	178.467
TOTAL	-55.626	0.000	0.000	0.000	195.174	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-50.309	0.000	0.000	0.001	110.739	-809.139
RIGHT ENG	-50.309	0.000	0.000	-0.001	110.739	809.139
TOTAL	-100.618	0.000	0.000	0.000	221.477	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1335.286	0.000	-13144.344	0.000	4827.988	0.000
ROTOR						
LEFT ROTOR	932.744	60.211	75.781	8076.147	-2775.073	15489.727
RIGHT ROTOR	932.744	-60.211	75.781	-8076.147	-2775.073	-15489.727
HUB SPINNER	-319.216	0.000	-5.167	0.000	725.997	0.000
TOTAL ROTOR	1546.272	0.000	146.395	0.000	-4824.148	0.000
TOTAL AIRCRAFT (BODY AXIS)	210.987	0.000	-12997.948	0.000	3.840	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.065	0.000	0.338	0.000	3.840	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.8468	0.0000	-0.8646	0.0000	-0.1316	0.0000
	ROTOR	0.0000	-0.0898	0.0000	-0.2466	0.0000	-0.2129	0.0000
	AIRFRM	0.0000	-0.7570	0.0000	-0.6180	0.0000	0.0813	0.0000
Q	TOTAL	0.5711	0.0000	-11.6278	0.0000	-1.4423	0.0000	0.9923
	ROTOR	0.6696	0.0000	-7.3090	0.0000	0.4648	0.0000	0.9923
	AIRFRM	-0.0985	0.0000	-4.3189	0.0000	-1.9071	0.0000	0.0000
R	TOTAL	0.0000	10.6522	0.0000	-0.0835	0.0000	-0.6752	0.0000
	ROTOR	0.0000	7.3014	0.0000	-0.2482	0.0000	-0.2050	0.0000
	AIRFRM	0.0000	3.3508	0.0000	0.1647	0.0000	-0.4702	0.0000
U	TOTAL	-0.2507	0.0000	-0.2870	0.0000	0.0210	0.0000	-0.8789
	ROTOR	-0.2304	0.0000	-0.0063	0.0000	0.0106	0.0000	-0.8789
	AIRFRM	-0.0203	0.0000	-0.2807	0.0000	0.0104	0.0000	0.0000
V	TOTAL	0.0000	-0.2874	0.0000	-0.0080	0.0000	0.0104	0.0000
	ROTOR	0.0000	-0.0604	0.0000	-0.0015	0.0000	-0.0025	0.0000
	AIRFRM	0.0000	-0.2271	0.0000	-0.0064	0.0000	0.0129	0.0000
W	TOTAL	0.0736	0.0000	-1.1072	0.0000	-0.0225	0.0000	0.0164
	ROTOR	0.0110	0.0000	-0.0611	0.0000	0.0071	0.0000	0.0164
	AIRFRM	0.0626	0.0000	-1.0460	0.0000	-0.0296	0.0000	0.0000
RPM	TOTAL	2.0936	0.0000	1.2768	0.0000	-0.1591	0.0000	8.4290
	ROTOR	2.0782	0.0000	0.0773	0.0000	-0.0975	0.0000	8.4290
	AIRFRM	0.0154	0.0000	1.1996	0.0000	-0.0616	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.4698
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-3.4698
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.8323	0.0000	2.5283	0.0000	-0.3010	0.0000	15.1369
	ROTOR	3.8124	0.0000	0.1307	0.0000	-0.1784	0.0000	15.1369
	AIRFRM	0.0199	0.0000	2.3976	0.0000	-0.1227	0.0000	0.0000
XLN	TOTAL	-0.1019	0.0000	-3.6335	0.0000	-1.5690	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1019	0.0000	-3.6335	0.0000	-1.5690	0.0000	0.0000
XLT	TOTAL	0.0000	0.0065	0.0000	0.4785	0.0000	0.0684	0.0000
	ROTOR	0.0000	0.0065	0.0000	0.0276	0.0000	0.0450	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.4509	0.0000	0.0234	0.0000
XPD	TOTAL	0.0000	-2.4781	0.0000	-0.0690	0.0000	0.3377	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.4781	0.0000	-0.0690	0.0000	0.3377	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	472.6	-.7105E-14	0.0000E+00
ACCEL	(FPS2)	-.8463E-04	0.5408E-06	-.2447E-03

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	472.6	0.7840E-07	3.367	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1129E-05	-.1925E-04	0.3399E-07

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	12001.49
PRESSURE ALT. (FT)	12000.00
AMBIENT TEMP (DEG-R)	264.39
OUTSIDE AIR TEMP (DEG-C)	-8.77
AIR DENSITY (SLUGS/FT3)	0.1648E-02
THETES (ND)	0.91750
DELSTD (ND)	0.63599
SIGMA PRIME (ND)	0.69318

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		238.48
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		183.99
ANGLE OF ATTACK (DEG)		0.408
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		0.408
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	9.4221	94.22
LONG	(FWD)	5.5535	57.85
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	1064.	0.1081E+05	23.17	825.4	0.7719
RIGHT	1064.	0.1081E+05	23.17	825.4	0.7719
ENGINE	1154.				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	78.9671	78.9671
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR

FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.3210	-2.1476	-0.8412	1031.47	-145.42	-70.48	-56.29
RIGHT	1.3210	-2.1476	-0.8412	1031.47	-145.42	-70.48	-56.29

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8338	0.0050	1.3918	0.7003	0.002335	0.002785	0.013604
RIGHT	0.8338	0.0050	1.3918	0.7003	0.002335	0.002785	0.013604

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01527	0.01566	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01527	0.01566				

SURFACE POSITIONS (DEG)	
ELEVATOR	3.5678
AILERON	0.0000
RUDDER	0.0000

TIME USED FOR THIS TRIM = 0.0153 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-465.539	0.000	-1401.554	0.000	-9793.647	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-703.190	0.000	-12366.339	0.000	4225.882	0.000
TOTAL	-703.190	0.000	-12366.339	0.000	4225.882	0.000
ENGINE PYLONS	-185.720	0.000	-1.317	0.000	408.606	0.000
HORIZ. STAB.	-70.012	0.000	481.474	0.000	10674.733	0.000
VERT. STAB.						
FIN NO. 1	-32.665	0.000	0.000	0.000	114.610	-209.600
FIN NO. 2	-32.665	0.000	0.000	0.000	114.610	209.600
TOTAL	-65.330	0.000	0.000	0.000	229.221	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-56.287	0.000	0.000	0.001	123.898	-905.290
RIGHT ENG	-56.287	0.000	0.000	-0.001	123.898	905.290
TOTAL	-112.575	0.000	0.000	0.000	247.796	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1602.366	0.000	-13287.736	0.000	5992.589	0.000
ROTOR						
LEFT ROTOR	1032.547	73.004	145.397	8619.556	-3409.604	17218.430
RIGHT ROTOR	1032.547	-73.004	145.397	-8619.557	-3409.604	-17218.430
HUB SPINNER	-370.136	0.000	-2.630	0.000	826.613	0.000
TOTAL ROTOR	1694.957	0.000	288.165	-0.001	-5992.596	0.000
TOTAL AIRCRAFT (BODY AXIS)	92.592	0.000	-12999.571	-0.001	-0.007	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.035	0.000	0.099	-0.001	-0.007	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.9223	0.0000	-0.9814	0.0000	-0.1247	0.0000
	ROTOR	0.0000	-0.0833	0.0000	-0.2731	0.0000	-0.2223	0.0000
	AIRFRM	0.0000	-0.8389	0.0000	-0.7082	0.0000	0.0977	0.0000
Q	TOTAL	0.5332	0.0000	-12.9456	0.0000	-1.5604	0.0000	1.0529
	ROTOR	0.6699	0.0000	-7.8352	0.0000	0.5100	0.0000	1.0529
	AIRFRM	-0.1368	0.0000	-5.1104	0.0000	-2.0704	0.0000	0.0000
R	TOTAL	0.0000	11.5350	0.0000	-0.0838	0.0000	-0.6948	0.0000
	ROTOR	0.0000	7.8215	0.0000	-0.2607	0.0000	-0.1754	0.0000
	AIRFRM	0.0000	3.7135	0.0000	0.1769	0.0000	-0.5195	0.0000
U	TOTAL	-0.2418	0.0000	-0.3152	0.0000	0.0221	0.0000	-0.9193
	ROTOR	-0.2239	0.0000	-0.0062	0.0000	0.0103	0.0000	-0.9193
	AIRFRM	-0.0179	0.0000	-0.3090	0.0000	0.0118	0.0000	0.0000
V	TOTAL	0.0000	-0.3160	0.0000	-0.0088	0.0000	0.0117	0.0000
	ROTOR	0.0000	-0.0668	0.0000	-0.0018	0.0000	-0.0027	0.0000
	AIRFRM	0.0000	-0.2491	0.0000	-0.0069	0.0000	0.0145	0.0000
W	TOTAL	0.0618	0.0000	-1.2062	0.0000	-0.0239	0.0000	0.0193
	ROTOR	0.0109	0.0000	-0.0670	0.0000	0.0077	0.0000	0.0193
	AIRFRM	0.0509	0.0000	-1.1392	0.0000	-0.0316	0.0000	0.0000
RPM	TOTAL	2.1701	0.0000	1.6511	0.0000	-0.1800	0.0000	9.5932
	ROTOR	2.1913	0.0000	0.0941	0.0000	-0.1038	0.0000	9.5932
	AIRFRM	-0.0212	0.0000	1.5571	0.0000	-0.0762	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.3589
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.3589
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.9343	0.0000	3.3063	0.0000	-0.3432	0.0000	17.1109
	ROTOR	3.9915	0.0000	0.1892	0.0000	-0.1914	0.0000	17.1109
	AIRFRM	-0.0572	0.0000	3.1171	0.0000	-0.1518	0.0000	0.0000
XLN	TOTAL	-0.1341	0.0000	-4.2694	0.0000	-1.8429	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1341	0.0000	-4.2694	0.0000	-1.8429	0.0000	0.0000
XLT	TOTAL	0.0000	0.0085	0.0000	0.5541	0.0000	0.0786	0.0000
	ROTOR	0.0000	0.0085	0.0000	0.0310	0.0000	0.0472	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.5231	0.0000	0.0314	0.0000
XPD	TOTAL	0.0000	-2.8599	0.0000	-0.0796	0.0000	0.3897	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.8599	0.0000	-0.0796	0.0000	0.3897	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, 12000 FT

CONFIGURATION:

NACELLE INCIDENCE	0.0 DEG	GEAR	0.0 % DOWN			ALTITUDE	
FLAP SETTING	0/0 DEG	STAB INCIDENCE	0.000 DEG			PRES(MSL)	12000.0 FT
ROTOR RPM	517.0 RPM	INERTIA, SLUG-FT2				DENSITY	12001.5 FT
GROSS WEIGHT	13000.0 LB	IXX	50950.	IXZ	1075.6	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	298.226 IN	IYY	20348.	IZZ	67168.	TEMP(OAT)	-8.77 DEG-C
W.L.	73.586 IN	SIGMAP	0.69318 -ND-			VSOUND	633.61 KTS
		RHO	0.0016476 SLG/FT3			WIND-V	0.00 KTS

U/VKCAS -KTS

NOTE: SYMBOL INDICATES A TRIM PROBLEM

	140.00	160.00	180.00	200.00	220.00	240.00	260.00	280.00
	117.28	134.28	151.37	168.56	185.86	203.28	220.81	238.47
AIRCRAFT CONTROL SETTINGS:								
XLN,%	34.6332	45.6979	50.0151	52.7716	54.6614	55.9835	57.0206	57.8489
XLT,%	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
XPD,%	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
XCOL,%	50.0777	51.1866	55.8496	61.7559	68.9329	76.5208	83.6740	94.2206
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000
THETO,DEG	60.6649	63.8236	66.8169	69.5934	72.1929	74.6142	76.8635	78.9671
THOG,DEG	4.8649	8.0236	11.0169	13.7934	16.3929	18.8142	21.0635	23.1671
ELEVATOR,DEG	-6.9851	-1.9556	0.0069	1.2599	2.1189	2.7198	3.1913	3.5678
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	0.8792	0.4753	0.0583	-0.3727	-0.8127	-1.2482	-1.6974	-2.1476
LTFLP,DEG	0.5874	0.3500	0.1720	0.0001	-0.1793	-0.3724	-0.5929	-0.8412
THRUST,LB	797.50	697.68	694.84	719.87	776.62	850.17	931.86	1031.5
CT	0.0022	0.0019	0.0019	0.0019	0.0021	0.0023	0.0025	0.0028
H-FORCE,LB	218.24	183.77	142.53	95.917	43.725	-12.626	-75.792	-145.42
Y-FORCE,LB	-43.111	-39.912	-38.931	-40.236	-43.987	-50.169	-58.897	-70.477
HORSEPOWER	408.28	424.50	480.41	552.91	650.38	768.00	902.52	1064.0
Q,FT-LB	4147.6	4312.4	4880.4	5616.9	6607.1	7802.0	9168.6	10809.
CP	0.0009	0.0009	0.0011	0.0012	0.0014	0.0017	0.0020	0.0023
RPM,ROTOR	517.00	517.00	517.00	517.00	517.00	517.00	517.00	517.00
WI,FT/SEC	2.1547	1.6563	1.4687	1.3701	1.3431	1.3458	1.3581	1.3918
MU	0.0716	0.0554	0.0427	0.0324	0.0239	0.0168	0.0105	0.0050
LAMDA	0.3448	0.3976	0.4490	0.4997	0.5501	0.6003	0.6503	0.7003
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	11.8375	7.9850	5.4577	3.7255	2.4933	1.6088	0.9302	0.4082
PITCH,DEG	11.8375	7.9850	5.4577	3.7255	2.4933	1.6088	0.9302	0.4082
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	45.9967	60.0773	76.0354	93.8708	113.5837	135.1740	158.6418	183.9869
MACH NUMBER	0.2210	0.2525	0.2841	0.3157	0.3472	0.3788	0.4104	0.4419
VT,KNOTS	140.0000	160.0000	180.0000	200.0000	220.0000	240.0000	260.0000	280.0000
VKCAS,KNOTS	117.2804	134.2784	151.3692	168.5609	185.8608	203.2763	220.8123	238.4734
HP-ENG	448.99	466.42	526.54	604.49	709.29	835.75	980.41	1154.0

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0017 MIN TOTAL TIME USED IN THIS RUN = 0.4862 MIN

TIME: 23:12:03
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 23:12:03

XV-15 STATIC TRIM, FORCE AND MOMENT, AND STABILITY/CONTROL DERIVATIVE PRINTOUTS

FLIGHT CONDITIONS

Gross Weight	=	13000.0 pounds
Helicopter CG	=	301.2 inches
Mast Angle Position	=	90.0 degrees
Nacelle Incidence	=	0.0 degrees
Rotor Speed	=	517.0 RPM
Flap/Flaperon Position	=	0/0 degrees
Altitude	=	20,000 feet Standard Day
True Airspeeds	=	160, 180, 200, 220, 240, 260, 280, 300 knots

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	270.0	0.0000E+00	-.3815E-05
ACCEL	(FPS2)	0.1690E-02	-.2027E-05	0.5241E-02

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	264.6	0.1918E-05	54.19	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.2956E-04	0.1987E-01	0.2213E-04

ATMOSPHERIC CONDITIONS		FLIGHT PATH CONDITIONS		INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
ALTITUDE (FT)	5000.00	CAL. AIRSPEED (KNOTS)	118.29				
DENSITY ALT. (FT)	20002.41	RATE OF DECENT (FPS)	0.00				
PRESSURE ALT. (FT)	20000.00	G-LEVEL (G S)	1.00	IXX	0.5095E+05	S.L.	298.2
AMBIENT TEMP (DEG-R)	248.54	DYN PRES (SLUGS/FT-SEC2)	46.18	IXZ	1076.	B.L.	0.0000E+00
OUTSIDE AIR TEMP (DEG-C)	-24.62	ANGLE OF ATTACK (DEG)	11.575	IYY	0.2035E+05	W.L.	73.59
AIR DENSITY (SLUGS/FT3)	0.1266E-02	FLIGHT PATH ANGLE (DEG)	0.000	IZZ	0.6717E+05		
		SIDESLIP ANGLE (DEG)	0.000				
THETES (ND)	0.86249	ROLL ANGLE (DEG)	0.000				
DELSTD (ND)	0.45956	PITCH ANGLE (DEG)	11.575				
SIGMA PRIME (ND)	0.53282	YAW ANGLE (DEG)	0.000				

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	6.9548	69.55
LONG	(FWD)	3.4378	35.81
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	440.9	4479.	8.231	728.6	0.7027
RIGHT	440.9	4479.	8.231	728.6	0.7027
ENGINE	484.0				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	64.0313	64.0313
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2374	1.5736	0.8280	807.02	228.52	-27.35	-17.99
RIGHT	1.2374	1.5736	0.8280	807.02	228.52	-27.35	-17.99

SURFACE POSITIONS (DEG)	
ELEVATOR	-6.4502
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8992	0.0801	2.4821	0.3945	0.001258	0.002834	0.013612
RIGHT	0.8992	0.0801	2.4821	0.3945	0.001258	0.002834	0.013612

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02910	0.01093	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02910	0.01093				

TIME USED FOR THIS TRIM = 0.0423 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-40.629	0.000	-842.921	0.000	5919.086	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	1214.986	0.000	-11007.875	0.030	3126.473	-0.002
TOTAL	1214.986	0.000	-11007.875	0.030	3126.473	-0.002
ENGINE PYLONS	-46.581	0.000	-9.400	0.000	101.143	0.000
HORIZ. STAB.	10.776	0.000	-400.875	0.000	-8771.308	0.000
VERT. STAB.						
FIN NO. 1	-5.800	-0.001	0.000	-0.002	20.350	-37.201
FIN NO. 2	-5.800	-0.001	0.000	-0.002	20.350	37.229
TOTAL	-11.600	-0.001	0.000	-0.004	40.699	0.028
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-17.988	0.000	0.000	0.000	39.594	-289.299
RIGHT ENG	-17.988	0.000	0.000	0.000	39.594	289.299
TOTAL	-35.975	0.000	0.000	0.000	79.187	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	1090.978	-0.001	-12261.071	0.026	495.281	0.025
ROTOR						
LEFT ROTOR	807.370	23.360	-228.485	8223.366	-393.999	12964.072
RIGHT ROTOR	807.370	-23.360	-228.485	-8223.366	-393.999	-12964.072
HUB SPINNER	-96.137	0.000	-19.508	0.000	299.772	0.000
TOTAL ROTOR	1518.602	0.000	-476.477	0.000	-488.225	0.000
TOTAL AIRCRAFT (BODY AXIS)	2609.580	-0.001	-12737.549	0.026	7.056	0.025
TOTAL AIRCRAFT (INERTIAL AXIS)	1.094	-0.001	-1.937	0.026	7.056	0.026

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =160.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.2911	0.0000	-0.3658	0.0000	-0.1637	0.0000
	ROTOR	0.0000	-0.0494	0.0000	-0.1054	0.0000	-0.1385	0.0000
	AIRFRM	0.0000	-0.2418	0.0000	-0.2603	0.0000	-0.0252	0.0000
Q	TOTAL	0.6352	0.0000	-5.9611	0.0000	-0.6814	0.0000	0.2873
	ROTOR	0.5225	0.0000	-4.3527	0.0000	0.1834	0.0000	0.2873
	AIRFRM	0.1127	0.0000	-1.6084	0.0000	-0.8647	0.0000	0.0000
R	TOTAL	0.0000	5.3400	0.0000	-0.0766	0.0000	-0.4595	0.0000
	ROTOR	0.0000	4.2767	0.0000	-0.1734	0.0000	-0.3040	0.0000
	AIRFRM	0.0000	1.0633	0.0000	0.0968	0.0000	-0.1555	0.0000
U	TOTAL	-0.2023	0.0000	-0.1891	0.0000	0.0160	0.0000	-0.4669
	ROTOR	-0.2050	0.0000	-0.0043	0.0000	0.0092	0.0000	-0.4669
	AIRFRM	0.0027	0.0000	-0.1849	0.0000	0.0068	0.0000	0.0000
V	TOTAL	0.0000	-0.1116	0.0000	-0.0039	0.0000	0.0027	0.0000
	ROTOR	0.0000	-0.0264	0.0000	-0.0005	0.0000	-0.0013	0.0000
	AIRFRM	0.0000	-0.0852	0.0000	-0.0034	0.0000	0.0040	0.0000
W	TOTAL	0.1409	0.0000	-0.4960	0.0000	-0.0236	0.0000	0.0166
	ROTOR	0.0168	0.0000	-0.0269	0.0000	0.0031	0.0000	0.0166
	AIRFRM	0.1241	0.0000	-0.4690	0.0000	-0.0266	0.0000	0.0000
RPM	TOTAL	1.1170	0.0000	0.1973	0.0000	-0.0571	0.0000	2.9050
	ROTOR	1.1579	0.0000	-0.0032	0.0000	-0.0511	0.0000	2.9050
	AIRFRM	-0.0409	0.0000	0.2005	0.0000	-0.0060	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.1299
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.1299
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.2629	0.0000	0.3274	0.0000	-0.1035	0.0000	5.7439
	ROTOR	2.3748	0.0000	-0.1589	0.0000	-0.0895	0.0000	5.7439
	AIRFRM	-0.1120	0.0000	0.4863	0.0000	-0.0140	0.0000	0.0000
XLN	TOTAL	0.0788	0.0000	-1.0141	0.0000	-0.4431	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0788	0.0000	-1.0141	0.0000	-0.4431	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0017	0.0000	0.1250	0.0000	0.0225	0.0000
	ROTOR	0.0000	-0.0017	0.0000	0.0114	0.0000	0.0276	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1136	0.0000	-0.0051	0.0000
XPD	TOTAL	0.0000	-0.7408	0.0000	-0.0206	0.0000	0.1009	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-0.7408	0.0000	-0.0206	0.0000	0.1009	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	303.8	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.3914E-03	-.1143E-06	-.6815E-03

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	300.7	0.0000E+00	43.46	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.8125E-05	0.4224E-03	0.1650E-04

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	20002.41
PRESSURE ALT. (FT)	20000.00
AMBIENT TEMP (DEG-R)	248.54
OUTSIDE AIR TEMP (DEG-C)	-24.62
AIR DENSITY (SLUGS/FT3)	0.1266E-02
THETES (ND)	0.86249
DELSTD (ND)	0.45956
SIGMA PRIME (ND)	0.53282

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	133.50
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	58.45
ANGLE OF ATTACK	(DEG)	8.225
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	8.225
YAW ANGLE	(DEG)	0.000

----- INERTIAS ----- (SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY ----- (IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	7.0418	70.42
LONG	(FWD)	4.3609	45.43
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	453.7	4609.	11.15	741.8	0.7155
RIGHT	453.7	4609.	11.15	741.8	0.7155
ENGINE	497.8				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETAO	66.9499	66.9499
B1	1.5000	1.5000
A1	0.0000	0.0000

----------- ROTOR -----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.2025	1.1028	0.5707	713.37	197.87	-26.81	-26.95
RIGHT	1.2025	1.1028	0.5707	713.36	197.87	-26.81	-26.95

------- SURFACE POSITIONS -------

	(DEG)
ELEVATOR	-2.0791
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8690	0.0642	1.9577	0.4471	0.001295	0.002505	0.013669
RIGHT	0.8690	0.0642	1.9577	0.4471	0.001295	0.002505	0.013669

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02660	0.01154	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02660	0.01154				

TIME USED FOR THIS TRIM = 0.0187 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-72.654	0.000	-877.017	0.000	5566.938	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	766.563	0.000	-11149.123	0.000	3751.483	0.000
TOTAL	766.563	0.000	-11149.123	0.000	3751.483	0.000
ENGINE PYLONS	-59.044	0.000	-8.446	0.000	128.716	0.000
HORIZ. STAB.	-12.766	0.000	-418.638	0.000	-9101.086	0.000
VERT. STAB.						
FIN NO. 1	-8.364	0.000	0.000	0.000	29.347	-53.670
FIN NO. 2	-8.364	0.000	0.000	0.000	29.347	53.670
TOTAL	-16.728	0.000	0.000	0.000	58.694	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-26.952	0.000	0.000	0.000	59.327	-433.483
RIGHT ENG	-26.952	0.000	0.000	0.000	59.327	433.483
TOTAL	-53.905	0.000	0.000	0.000	118.653	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	551.467	0.000	-12453.224	0.000	523.398	-0.001
ROTOR						
LEFT ROTOR	713.724	23.350	-197.836	7857.993	-431.258	11509.986
RIGHT ROTOR	713.724	-23.350	-197.836	-7857.993	-431.258	-11509.986
HUB SPINNER	-119.036	0.000	-17.095	0.000	339.272	0.000
TOTAL ROTOR	1308.412	0.000	-412.768	0.000	-523.244	0.000
TOTAL AIRCRAFT (BODY AXIS)	1859.879	0.000	-12865.991	0.000	0.153	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.116	0.000	0.294	0.000	0.153	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =180.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.3653	0.0000	-0.4358	0.0000	-0.1541	0.0000
	ROTOR	0.0000	-0.0519	0.0000	-0.1235	0.0000	-0.1460	0.0000
	AIRFRM	0.0000	-0.3134	0.0000	-0.3123	0.0000	-0.0081	0.0000
Q	TOTAL	0.5328	0.0000	-6.7432	0.0000	-0.7567	0.0000	0.3571
	ROTOR	0.5325	0.0000	-5.0263	0.0000	0.2382	0.0000	0.3571
	AIRFRM	0.0004	0.0000	-1.7169	0.0000	-0.9949	0.0000	0.0000
R	TOTAL	0.0000	6.3595	0.0000	-0.0854	0.0000	-0.4705	0.0000
	ROTOR	0.0000	4.9767	0.0000	-0.1856	0.0000	-0.2709	0.0000
	AIRFRM	0.0000	1.3828	0.0000	0.1002	0.0000	-0.1995	0.0000
U	TOTAL	-0.2017	0.0000	-0.1942	0.0000	0.0153	0.0000	-0.5264
	ROTOR	-0.2030	0.0000	-0.0045	0.0000	0.0091	0.0000	-0.5264
	AIRFRM	0.0013	0.0000	-0.1898	0.0000	0.0062	0.0000	0.0000
V	TOTAL	0.0000	-0.1338	0.0000	-0.0043	0.0000	0.0037	0.0000
	ROTOR	0.0000	-0.0303	0.0000	-0.0007	0.0000	-0.0015	0.0000
	AIRFRM	0.0000	-0.1035	0.0000	-0.0037	0.0000	0.0052	0.0000
W	TOTAL	0.1240	0.0000	-0.5737	0.0000	-0.0194	0.0000	0.0163
	ROTOR	0.0147	0.0000	-0.0310	0.0000	0.0037	0.0000	0.0163
	AIRFRM	0.1093	0.0000	-0.5427	0.0000	-0.0230	0.0000	0.0000
RPM	TOTAL	1.2193	0.0000	0.3026	0.0000	-0.0699	0.0000	3.5742
	ROTOR	1.2708	0.0000	0.0053	0.0000	-0.0566	0.0000	3.5742
	AIRFRM	-0.0515	0.0000	0.2973	0.0000	-0.0133	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.1946
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.1946
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.3779	0.0000	0.5431	0.0000	-0.1276	0.0000	6.8352
	ROTOR	2.5051	0.0000	-0.1269	0.0000	-0.0981	0.0000	6.8352
	AIRFRM	-0.1272	0.0000	0.6700	0.0000	-0.0295	0.0000	0.0000
XLN	TOTAL	0.0401	0.0000	-1.2978	0.0000	-0.5641	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0401	0.0000	-1.2978	0.0000	-0.5641	0.0000	0.0000
XLT	TOTAL	0.0000	-0.0007	0.0000	0.1843	0.0000	0.0212	0.0000
	ROTOR	0.0000	-0.0007	0.0000	0.0132	0.0000	0.0292	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.1711	0.0000	-0.0080	0.0000
XPD	TOTAL	0.0000	-0.9322	0.0000	-0.0259	0.0000	0.1270	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-0.9322	0.0000	-0.0259	0.0000	0.1270	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	337.6	0.0000E+00	0.3815E-05
ACCEL	(FPS2)	0.2524E-03	0.1729E-07	-.1458E-02

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	335.8	0.3244E-07	34.83	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.6043E-08	0.3484E-01	-.9676E-10

ATMOSPHERIC CONDITIONS		
ALTITUDE	(FT)	5000.00
DENSITY ALT.	(FT)	20002.41
PRESSURE ALT.	(FT)	20000.00
AMBIENT TEMP	(DEG-R)	248.54
OUTSIDE AIR TEMP	(DEG-C)	-24.62
AIR DENSITY	(SLUGS/FT3)	0.1266E-02
THETES	(ND)	0.86249
DELSTD	(ND)	0.45956
SIGMA PRIME	(ND)	0.53282

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED	(KNOTS)	148.87
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	72.16
ANGLE OF ATTACK	(DEG)	5.923
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	5.923
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	7.5715	75.72
LONG	(FWD)	4.7504	49.48
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	508.8	5169.	13.94	756.3	0.7294
RIGHT	508.8	5169.	13.94	756.3	0.7294
ENGINE	557.1				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	69.7434	69.7434
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR FLAPPING	A0 (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2011	0.6343	0.3823	709.56	162.15	-27.86	-34.10
RIGHT	1.2011	0.6343	0.3823	709.56	162.15	-27.86	-34.10

SURFACE POSITIONS (DEG)	
ELEVATOR	-0.2348
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8564	0.0515	1.7553	0.4987	0.001452	0.002492	0.013670
RIGHT	0.8564	0.0515	1.7553	0.4987	0.001452	0.002492	0.013670

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02381	0.01223	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02381	0.01223				

TIME USED FOR THIS TRIM = 0.0157 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-124.465	0.000	-926.227	0.000	3832.859	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	385.955	0.000	-11312.081	0.000	4229.322	0.000
TOTAL	385.955	0.000	-11312.081	0.000	4229.322	0.000
ENGINE PYLONS	-72.969	0.000	-7.507	0.000	159.507	0.000
HORIZ. STAB.	-30.572	0.000	-344.893	0.000	-7448.736	0.000
VERT. STAB.						
FIN NO. 1	-11.119	0.000	0.000	0.000	39.012	-71.345
FIN NO. 2	-11.119	0.000	0.000	0.000	39.012	71.345
TOTAL	-22.237	0.000	0.000	0.000	78.024	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-34.104	0.000	0.000	0.000	75.069	-548.511
RIGHT ENG	-34.104	0.000	0.000	0.000	75.069	548.511
TOTAL	-68.209	0.000	0.000	0.000	150.138	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	67.502	0.000	-12590.708	0.000	1001.115	0.000
ROTOR						
LEFT ROTOR	709.940	25.029	-162.122	7844.502	-688.967	11500.625
RIGHT ROTOR	709.940	-25.029	-162.122	-7844.502	-688.967	-11500.625
HUB SPINNER	-145.900	0.000	-15.057	0.000	389.194	0.000
TOTAL ROTOR	1273.980	0.000	-339.300	0.000	-988.740	0.000
TOTAL AIRCRAFT (BODY AXIS)	1341.482	0.000	-12930.009	0.000	12.375	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.041	0.000	0.596	0.000	12.375	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

********** *** VT =200.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE *** *** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 *** *** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG *** **********

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.4282	0.0000	-0.4943	0.0000	-0.1453	0.0000
	ROTOR	0.0000	-0.0485	0.0000	-0.1426	0.0000	-0.1537	0.0000
	AIRFRM	0.0000	-0.3797	0.0000	-0.3517	0.0000	0.0084	0.0000
Q	TOTAL	0.4847	0.0000	-7.5079	0.0000	-0.8333	0.0000	0.4418
	ROTOR	0.5410	0.0000	-5.6266	0.0000	0.2865	0.0000	0.4418
	AIRFRM	-0.0563	0.0000	-1.8813	0.0000	-1.1197	0.0000	0.0000
R	TOTAL	0.0000	7.2780	0.0000	-0.0924	0.0000	-0.4789	0.0000
	ROTOR	0.0000	5.5999	0.0000	-0.1997	0.0000	-0.2392	0.0000
	AIRFRM	0.0000	1.6781	0.0000	0.1073	0.0000	-0.2397	0.0000
U	TOTAL	-0.2007	0.0000	-0.2017	0.0000	0.0148	0.0000	-0.5756
	ROTOR	-0.1984	0.0000	-0.0046	0.0000	0.0090	0.0000	-0.5756
	AIRFRM	-0.0024	0.0000	-0.1971	0.0000	0.0059	0.0000	0.0000
V	TOTAL	0.0000	-0.1555	0.0000	-0.0048	0.0000	0.0046	0.0000
	ROTOR	0.0000	-0.0344	0.0000	-0.0008	0.0000	-0.0017	0.0000
	AIRFRM	0.0000	-0.1211	0.0000	-0.0040	0.0000	0.0063	0.0000
W	TOTAL	0.1065	0.0000	-0.6322	0.0000	-0.0150	0.0000	0.0160
	ROTOR	0.0130	0.0000	-0.0352	0.0000	0.0043	0.0000	0.0160
	AIRFRM	0.0935	0.0000	-0.5970	0.0000	-0.0193	0.0000	0.0000
RPM	TOTAL	1.3323	0.0000	0.4359	0.0000	-0.0816	0.0000	4.3078
	ROTOR	1.3784	0.0000	0.0141	0.0000	-0.0619	0.0000	4.3078
	AIRFRM	-0.0461	0.0000	0.4218	0.0000	-0.0197	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6493
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.6493
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.5174	0.0000	0.8099	0.0000	-0.1481	0.0000	7.9915
	ROTOR	2.6264	0.0000	-0.0930	0.0000	-0.1065	0.0000	7.9915
	AIRFRM	-0.1090	0.0000	0.9029	0.0000	-0.0417	0.0000	0.0000
XLN	TOTAL	0.0054	0.0000	-1.6165	0.0000	-0.7005	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0054	0.0000	-1.6165	0.0000	-0.7005	0.0000	0.0000
XLT	TOTAL	0.0000	0.0000	0.0000	0.2234	0.0000	0.0266	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0152	0.0000	0.0307	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2081	0.0000	-0.0041	0.0000
XPD	TOTAL	0.0000	-1.1442	0.0000	-0.0318	0.0000	0.1559	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.1442	0.0000	-0.0318	0.0000	0.1559	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

----- EARTH REFERENCE -----

		UE	VE	WE
RATE	(FPS)	371.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.2399E-03	-.2061E-06	-.3943E-04

---------- BODY REFERENCE ----------

	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	370.3	0.0000E+00	27.71	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				0.6379E-08	0.2524E-02	-.1145E-05

----- ATMOSPHERIC CONDITIONS -----

ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	20002.41
PRESSURE ALT. (FT)	20000.00
AMBIENT TEMP (DEG-R)	248.54
OUTSIDE AIR TEMP (DEG-C)	-24.62
AIR DENSITY (SLUGS/FT3)	0.1266E-02
THETES (ND)	0.86249
DELSTD (ND)	0.45956
SIGMA PRIME (ND)	0.53282

----- FLIGHT PATH CONDITIONS -----

CAL. AIRSPEED	(KNOTS)	164.39
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	87.31
ANGLE OF ATTACK	(DEG)	4.280
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	4.280
YAW ANGLE	(DEG)	0.000

----- INERTIAS -----

(SLUGS-FT2)

IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

----- CENTER OF GRAVITY -----

(IN)

S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

----- CONTROL DISPLACEMENTS -----

	(+)	(IN)	(PER)
COLL	(UP)	8.0133	80.13
LONG	(FWD)	5.0078	52.16
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

---------- POWER/TORQUE ---------- ---------- BLADE ----------

	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	TIP SPEED (FPS)	TIP MACH NO. (ND)
LEFT	574.9	5841.	16.52	771.9	0.7445
RIGHT	574.9	5841.	16.52	771.9	0.7445
ENGINE	628.2				

----- SWASH PLATE ANGLE (DEG) ----

	LEFT ROTOR	RIGHT ROTOR
THETA0	72.3204	72.3204
B1	1.5000	1.5000
A1	0.0000	0.0000

---------- ROTOR ----------

---------- FLAPPING ---------- ---- FORCES - MAST AXIS ------ -- JET --

	AO (DEG)	LONG (DEG)	LAT (DEG)	THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	THRUST (LBS)
LEFT	1.2061	0.1537	0.1995	723.04	122.04	-31.11	-41.45
RIGHT	1.2061	0.1537	0.1995	723.04	122.04	-31.11	-41.45

------- SURFACE POSITIONS -------

(DEG)

ELEVATOR	0.9837
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8495	0.0410	1.6273	0.5495	0.001641	0.002539	0.013659
RIGHT	0.8495	0.0410	1.6273	0.5495	0.001641	0.002539	0.013659

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.02079	0.01300	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.02079	0.01300				

TIME USED FOR THIS TRIM = 0.0155 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-174.475	0.000	-985.210	0.000	1874.943	-0.001
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	115.677	0.000	-11469.535	0.000	4465.102	0.000
TOTAL	115.677	0.000	-11469.535	0.000	4465.102	0.000
ENGINE PYLONS	-88.289	0.000	-6.562	0.000	193.369	0.000
HORIZ. STAB.	-42.398	0.000	-245.240	0.000	-5245.860	0.000
VERT. STAB.						
FIN NO. 1	-14.063	0.000	0.000	0.000	49.343	-90.240
FIN NO. 2	-14.063	0.000	0.000	0.000	49.343	90.240
TOTAL	-28.127	0.000	0.000	0.000	98.687	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-41.453	0.000	0.000	0.000	91.244	-666.696
RIGHT ENG	-41.453	0.000	0.000	0.000	91.244	666.696
TOTAL	-82.905	0.000	0.000	0.000	182.488	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-300.517	0.000	-12706.546	0.000	1568.730	-0.001
ROTOR						
LEFT ROTOR	723.476	28.971	-122.024	7876.961	-1007.334	11780.246
RIGHT ROTOR	723.476	-28.971	-122.024	-7876.961	-1007.334	-11780.246
HUB SPINNER	-176.054	0.000	-13.119	0.000	446.812	0.000
TOTAL ROTOR	1270.897	0.000	-257.168	0.000	-1567.857	0.000
TOTAL AIRCRAFT (BODY AXIS)	970.380	0.000	-12963.714	0.000	0.873	-0.001
TOTAL AIRCRAFT (INERTIAL AXIS)	0.102	0.000	0.028	0.000	0.873	-0.001

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =220.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.4848	0.0000	-0.5601	0.0000	-0.1377	0.0000
	ROTOR	0.0000	-0.0424	0.0000	-0.1618	0.0000	-0.1607	0.0000
	AIRFRM	0.0000	-0.4424	0.0000	-0.3983	0.0000	0.0230	0.0000
Q	TOTAL	0.4311	0.0000	-8.3036	0.0000	-0.9109	0.0000	0.5160
	ROTOR	0.5495	0.0000	-6.2098	0.0000	0.3336	0.0000	0.5160
	AIRFRM	-0.1184	0.0000	-2.0938	0.0000	-1.2445	0.0000	0.0000
R	TOTAL	0.0000	8.1566	0.0000	-0.0988	0.0000	-0.4861	0.0000
	ROTOR	0.0000	6.1999	0.0000	-0.2130	0.0000	-0.2083	0.0000
	AIRFRM	0.0000	1.9567	0.0000	0.1142	0.0000	-0.2777	0.0000
U	TOTAL	-0.1974	0.0000	-0.2116	0.0000	0.0152	0.0000	-0.6196
	ROTOR	-0.1932	0.0000	-0.0047	0.0000	0.0088	0.0000	-0.6196
	AIRFRM	-0.0042	0.0000	-0.2070	0.0000	0.0065	0.0000	0.0000
V	TOTAL	0.0000	-0.1767	0.0000	-0.0054	0.0000	0.0056	0.0000
	ROTOR	0.0000	-0.0387	0.0000	-0.0011	0.0000	-0.0018	0.0000
	AIRFRM	0.0000	-0.1380	0.0000	-0.0043	0.0000	0.0074	0.0000
W	TOTAL	0.0902	0.0000	-0.7075	0.0000	-0.0156	0.0000	0.0156
	ROTOR	0.0115	0.0000	-0.0393	0.0000	0.0049	0.0000	0.0156
	AIRFRM	0.0787	0.0000	-0.6682	0.0000	-0.0204	0.0000	0.0000
RPM	TOTAL	1.4250	0.0000	0.6040	0.0000	-0.0941	0.0000	5.0791
	ROTOR	1.4776	0.0000	0.0241	0.0000	-0.0670	0.0000	5.0791
	AIRFRM	-0.0526	0.0000	0.5798	0.0000	-0.0271	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.7526
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.7526
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.6338	0.0000	1.1422	0.0000	-0.1709	0.0000	9.2324
	ROTOR	2.7523	0.0000	-0.0562	0.0000	-0.1153	0.0000	9.2324
	AIRFRM	-0.1185	0.0000	1.1985	0.0000	-0.0556	0.0000	0.0000
XLN	TOTAL	-0.0167	0.0000	-1.9716	0.0000	-0.8533	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0167	0.0000	-1.9716	0.0000	-0.8533	0.0000	0.0000
XLT	TOTAL	0.0000	0.0008	0.0000	0.2673	0.0000	0.0327	0.0000
	ROTOR	0.0000	0.0008	0.0000	0.0174	0.0000	0.0322	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2499	0.0000	0.0005	0.0000
XPD	TOTAL	0.0000	-1.3764	0.0000	-0.0383	0.0000	0.1875	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.3764	0.0000	-0.0383	0.0000	0.1875	0.0000

********** AIRCRAFT TRIM FLIGHT CONDITIONS **********

****
*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	405.1	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.4938E-04	0.4016E-06	-.1413E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	404.5	0.3255E-06	21.84	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.8103E-07	0.4393E-03	0.1549E-06

ATMOSPHERIC CONDITIONS		FLIGHT PATH CONDITIONS			INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
ALTITUDE (FT)	5000.00	CAL. AIRSPEED (KNOTS)	180.08					
DENSITY ALT. (FT)	20002.41	RATE OF DECENT (FPS)	0.00					
PRESSURE ALT. (FT)	20000.00	G-LEVEL (G S)	1.00	IXX	0.5095E+05	S.L.	298.2	
AMBIENT TEMP (DEG-R)	248.54	DYN PRES (SLUGS/FT-SEC2)	103.90	IXZ	1076.	B.L.	0.0000E+00	
OUTSIDE AIR TEMP (DEG-C)	-24.62	ANGLE OF ATTACK (DEG)	3.091	IYY	0.2035E+05	W.L.	73.59	
AIR DENSITY (SLUGS/FT3)	0.1266E-02	FLIGHT PATH ANGLE (DEG)	0.000	IZZ	0.6717E+05			
		SIDESLIP ANGLE (DEG)	0.000					
THETES (ND)	0.86249	ROLL ANGLE (DEG)	0.000					
DELSTD (ND)	0.45956	PITCH ANGLE (DEG)	3.091					
SIGMA PRIME (ND)	0.53282	YAW ANGLE (DEG)	0.000					

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	8.8771	88.77
LONG	(FWD)	5.1851	54.01
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	669.2	6798.	18.95	788.7	0.7607
RIGHT	669.2	6798.	18.95	788.7	0.7607
ENGINE	729.5				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	74.7451	74.7451
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	1.8236
AILERON	0.0000
RUDDER	0.0000

ROTOR FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2244	-0.3193	0.0173	772.14	78.46	-36.64	-48.10
RIGHT	1.2244	-0.3193	0.0173	772.14	78.46	-36.64	-48.10

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8504	0.0323	1.5928	0.6000	0.001910	0.002712	0.013627
RIGHT	0.8504	0.0323	1.5928	0.6000	0.001910	0.002712	0.013627

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01752	0.01364	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01752	0.01364				

TIME USED FOR THIS TRIM = 0.0155 MIN

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-228.663	0.000	-1055.765	0.000	-148.755	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-120.900	0.000	-11622.574	0.000	4601.643	0.000
TOTAL	-120.900	0.000	-11622.574	0.000	4601.643	0.000
ENGINE PYLONS	-105.062	0.000	-5.638	0.000	230.425	0.000
HORIZ. STAB.	-49.640	0.000	-128.948	0.000	-2691.272	0.000
VERT. STAB.						
FIN NO. 1	-17.262	0.000	0.000	0.000	60.566	-110.763
FIN NO. 2	-17.262	0.000	0.000	0.000	60.566	110.763
TOTAL	-34.524	0.000	0.000	0.000	121.132	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-48.101	0.000	0.000	0.000	105.879	-773.631
RIGHT ENG	-48.101	0.000	0.000	0.000	105.879	773.631
TOTAL	-96.203	0.000	0.000	0.000	211.758	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-634.991	0.000	-12812.926	0.000	2324.930	0.000
ROTOR						
LEFT ROTOR	772.664	35.261	-78.447	8143.933	-1418.200	12646.642
RIGHT ROTOR	772.664	-35.261	-78.447	-8143.933	-1418.200	-12646.642
HUB SPINNER	-209.318	0.000	-11.260	0.000	511.627	0.000
TOTAL ROTOR	1336.010	0.000	-168.154	0.000	-2324.774	0.000
TOTAL AIRCRAFT (BODY AXIS)	701.019	0.000	-12981.079	0.000	0.156	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	-0.020	0.000	0.005	0.000	0.156	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =240.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.5383	0.0000	-0.6214	0.0000	-0.1309	0.0000
	ROTOR	0.0000	-0.0338	0.0000	-0.1819	0.0000	-0.1679	0.0000
	AIRFRM	0.0000	-0.5045	0.0000	-0.4395	0.0000	0.0370	0.0000
Q	TOTAL	0.4065	0.0000	-9.1806	0.0000	-0.9899	0.0000	0.5856
	ROTOR	0.5565	0.0000	-6.7651	0.0000	0.3789	0.0000	0.5856
	AIRFRM	-0.1500	0.0000	-2.4155	0.0000	-1.3688	0.0000	0.0000
R	TOTAL	0.0000	8.9989	0.0000	-0.1048	0.0000	-0.4939	0.0000
	ROTOR	0.0000	6.7667	0.0000	-0.2269	0.0000	-0.1787	0.0000
	AIRFRM	0.0000	2.2322	0.0000	0.1221	0.0000	-0.3152	0.0000
U	TOTAL	-0.1951	0.0000	-0.2233	0.0000	0.0159	0.0000	-0.6571
	ROTOR	-0.1877	0.0000	-0.0048	0.0000	0.0085	0.0000	-0.6571
	AIRFRM	-0.0074	0.0000	-0.2185	0.0000	0.0074	0.0000	0.0000
V	TOTAL	0.0000	-0.1979	0.0000	-0.0059	0.0000	0.0065	0.0000
	ROTOR	0.0000	-0.0432	0.0000	-0.0013	0.0000	-0.0020	0.0000
	AIRFRM	0.0000	-0.1548	0.0000	-0.0046	0.0000	0.0085	0.0000
W	TOTAL	0.0769	0.0000	-0.7810	0.0000	-0.0163	0.0000	0.0159
	ROTOR	0.0104	0.0000	-0.0435	0.0000	0.0054	0.0000	0.0159
	AIRFRM	0.0665	0.0000	-0.7375	0.0000	-0.0217	0.0000	0.0000
RPM	TOTAL	1.5301	0.0000	0.7907	0.0000	-0.1085	0.0000	5.9094
	ROTOR	1.5739	0.0000	0.0351	0.0000	-0.0720	0.0000	5.9094
	AIRFRM	-0.0438	0.0000	0.7557	0.0000	-0.0365	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.1619
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-2.1619
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.7862	0.0000	1.5104	0.0000	-0.1979	0.0000	10.5815
	ROTOR	2.8842	0.0000	-0.0175	0.0000	-0.1245	0.0000	10.5815
	AIRFRM	-0.0980	0.0000	1.5279	0.0000	-0.0734	0.0000	0.0000
XLN	TOTAL	-0.0374	0.0000	-2.3647	0.0000	-1.0225	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0374	0.0000	-2.3647	0.0000	-1.0225	0.0000	0.0000
XLT	TOTAL	0.0000	0.0017	0.0000	0.3160	0.0000	0.0396	0.0000
	ROTOR	0.0000	0.0017	0.0000	0.0197	0.0000	0.0339	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.2963	0.0000	0.0057	0.0000
XPD	TOTAL	0.0000	-1.6284	0.0000	-0.0453	0.0000	0.2219	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.6284	0.0000	-0.0453	0.0000	0.2219	0.0000

********** AIRCRAFT FLIGHT CONDITIONS **********
********** TRIM UNSUCCESSFUL - CONTROLS ARE OUT OF LIMITS **********

****
*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	438.8	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	0.1205E-03	0.4722E-06	-.1832E-04

BODY REFERENCE	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	438.5	0.2796E-06	16.68	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.7693E-07	0.1059E-03	0.1550E-06

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	20002.41
PRESSURE ALT. (FT)	20000.00
AMBIENT TEMP (DEG-R)	248.54
OUTSIDE AIR TEMP (DEG-C)	-24.62
AIR DENSITY (SLUGS/FT3)	0.1266E-02
THETES (ND)	0.86249
DELSTD (ND)	0.45956
SIGMA PRIME (ND)	0.53282

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED	(KNOTS)	195.94
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES (SLUGS/FT-SEC2)		121.94
ANGLE OF ATTACK	(DEG)	2.179
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	2.179
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	10.3604	103.60
LONG	(FWD)	5.3208	55.42
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	777.2	7896.	21.19	806.6	0.7779
RIGHT	777.2	7896.	21.19	806.6	0.7779
ENGINE	830.9				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	76.9931	76.9931
B1	1.5000	1.5000
A1	0.0000	0.0000

SURFACE POSITIONS (DEG)	
ELEVATOR	2.4659
AILERON	0.0000
RUDDER	0.0000

ROTOR

FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	-- JET -- THRUST (LBS)
LEFT	1.2459	-0.8091	-0.1885	829.86	29.41	-44.71	-54.82
RIGHT	1.2459	-0.8091	-0.1885	829.86	29.41	-44.71	-54.82

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8526	0.0246	1.5791	0.6502	0.002219	0.002915	0.013599
RIGHT	0.8526	0.0246	1.5791	0.6502	0.002219	0.002915	0.013599

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01406	0.01421	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01406	0.01421				

********** THIS IS NOT A VALID TRIM POINT **********

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-285.221	0.000	-1133.719	0.000	-2320.506	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-308.095	0.000	-11787.883	0.000	4619.658	0.000
TOTAL	-308.095	0.000	-11787.883	0.000	4619.658	0.000
ENGINE PYLONS	-123.261	0.000	-4.662	0.000	270.629	0.000
HORIZ. STAB.	-53.600	0.000	3.785	0.000	213.952	0.000
VERT. STAB.						
FIN NO. 1	-20.732	0.000	0.000	0.000	72.741	-133.029
FIN NO. 2	-20.732	0.000	0.000	0.000	72.741	133.029
TOTAL	-41.464	0.000	0.000	0.000	145.482	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-54.819	0.000	0.000	0.001	120.666	-881.674
RIGHT ENG	-54.819	0.000	0.000	-0.001	120.666	881.674
TOTAL	-109.638	0.000	0.000	0.000	241.332	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-921.278	0.000	-12922.479	0.000	3170.547	0.000
ROTOR						
LEFT ROTOR	830.518	44.191	-29.405	8468.523	-1876.519	13670.406
RIGHT ROTOR	830.518	-44.191	-29.405	-8468.523	-1876.519	-13670.406
HUB SPINNER	-245.538	0.000	-9.307	0.000	582.529	0.000
TOTAL ROTOR	1415.497	0.000	-68.117	0.000	-3170.509	0.000
TOTAL AIRCRAFT (BODY AXIS)	494.219	0.000	-12990.595	0.000	0.038	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.048	0.000	0.009	0.000	0.038	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =260.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.5919	0.0000	-0.6764	0.0000	-0.1238	0.0000
	ROTOR	0.0000	-0.0238	0.0000	-0.2025	0.0000	-0.1747	0.0000
	AIRFRM	0.0000	-0.5681	0.0000	-0.4740	0.0000	0.0509	0.0000
Q	TOTAL	0.4532	0.0000	-10.1733	0.0000	-1.0765	0.0000	0.6412
	ROTOR	0.5620	0.0000	-7.3144	0.0000	0.4244	0.0000	0.6412
	AIRFRM	-0.1088	0.0000	-2.8589	0.0000	-1.5008	0.0000	0.0000
R	TOTAL	0.0001	9.8370	0.0001	-0.1092	0.0000	-0.5032	0.0000
	ROTOR	0.0001	7.3228	0.0000	-0.2402	0.0000	-0.1498	0.0000
	AIRFRM	0.0000	2.5142	0.0001	0.1310	0.0000	-0.3535	0.0000
U	TOTAL	-0.1929	0.0000	-0.2399	0.0000	0.0168	0.0000	-0.6956
	ROTOR	-0.1822	0.0000	-0.0048	0.0000	0.0083	0.0000	-0.6956
	AIRFRM	-0.0107	0.0000	-0.2350	0.0000	0.0085	0.0000	0.0000
V	TOTAL	0.0000	-0.2197	0.0000	-0.0066	0.0000	0.0075	0.0000
	ROTOR	0.0000	-0.0478	0.0000	-0.0016	0.0000	-0.0022	0.0000
	AIRFRM	0.0000	-0.1719	0.0000	-0.0050	0.0000	0.0097	0.0000
W	TOTAL	0.0592	0.0000	-0.8535	0.0000	-0.0170	0.0000	0.0163
	ROTOR	0.0095	0.0000	-0.0477	0.0000	0.0060	0.0000	0.0163
	AIRFRM	0.0496	0.0000	-0.8057	0.0000	-0.0229	0.0000	0.0000
RPM	TOTAL	1.6346	0.0000	0.9997	0.0000	-0.1247	0.0000	6.7718
	ROTOR	1.6643	0.0000	0.0474	0.0000	-0.0769	0.0000	6.7718
	AIRFRM	-0.0296	0.0000	0.9523	0.0000	-0.0478	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0861
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0861
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	2.9532	0.0000	1.9295	0.0000	-0.2295	0.0000	12.0387
	ROTOR	3.0220	0.0000	0.0256	0.0000	-0.1344	0.0000	12.0387
	AIRFRM	-0.0688	0.0000	1.9040	0.0000	-0.0952	0.0000	0.0000
XLN	TOTAL	-0.0602	0.0000	-2.8084	0.0000	-1.2136	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0602	0.0000	-2.8084	0.0000	-1.2136	0.0000	0.0000
XLT	TOTAL	0.0000	0.0029	0.0000	0.3694	0.0000	0.0469	0.0000
	ROTOR	0.0000	0.0029	0.0000	0.0223	0.0000	0.0356	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.3471	0.0000	0.0113	0.0000
XPD	TOTAL	0.0000	-1.9010	0.0000	-0.0529	0.0000	0.2590	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-1.9010	0.0000	-0.0529	0.0000	0.2590	0.0000

********** AIRCRAFT FLIGHT CONDITIONS **********
********** TRIM UNSUCCESSFUL - CONTROLS ARE OUT OF LIMITS **********

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	472.6	0.1421E-13	0.0000E+00
ACCEL	(FPS2)	0.6619E-04	0.4999E-06	-.2120E-04

	BODY REFERENCE UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	472.4	0.2256E-06	12.11	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.6638E-07	0.3341E-03	0.1551E-06

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	20002.41
PRESSURE ALT. (FT)	20000.00
AMBIENT TEMP (DEG-R)	248.54
OUTSIDE AIR TEMP (DEG-C)	-24.62
AIR DENSITY (SLUGS/FT3)	0.1266E-02
THETES (ND)	0.86249
DELSTD (ND)	0.45956
SIGMA PRIME (ND)	0.53282

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED	(KNOTS)	212.00
RATE OF DECENT	(FPS)	0.00
G-LEVEL	(G S)	1.00
DYN PRES	(SLUGS/FT-SEC2)	141.42
ANGLE OF ATTACK	(DEG)	1.468
FLIGHT PATH ANGLE	(DEG)	0.000
SIDESLIP ANGLE	(DEG)	0.000
ROLL ANGLE	(DEG)	0.000
PITCH ANGLE	(DEG)	1.468
YAW ANGLE	(DEG)	0.000

INERTIAS (SLUGS-FT2)		CENTER OF GRAVITY (IN)	
IXX	0.5095E+05	S.L.	298.2
IXZ	1076.	B.L.	0.0000E+00
IYY	0.2035E+05	W.L.	73.59
IZZ	0.6717E+05		

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	10.2499	102.50
LONG	(FWD)	5.4291	56.55
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	902.0	9163.	23.28	825.4	0.7961
RIGHT	902.0	9163.	23.28	825.4	0.7961
ENGINE	851.3				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETAO	79.0834	79.0834
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR — FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2711	-1.3059	-0.4212	897.51	-24.82	-55.46	-61.63
RIGHT	1.2711	-1.3059	-0.4212	897.51	-24.82	-55.46	-61.63

SURFACE POSITIONS (DEG)	
ELEVATOR	2.9788
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8558	0.0179	1.5834	0.7004	0.002575	0.003152	0.013580
RIGHT	0.8558	0.0179	1.5834	0.7004	0.002575	0.003152	0.013580

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.01039	0.01470	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.01039	0.01470				

********** THIS IS NOT A VALID TRIM POINT **********

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-343.364	0.000	-1219.634	0.000	-4629.882	0.000
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-459.832	0.000	-11965.318	0.000	4544.900	0.000
TOTAL	-459.832	0.000	-11965.318	0.000	4544.900	0.000
ENGINE PYLONS	-142.897	0.000	-3.644	0.000	314.002	0.000
HORIZ. STAB.	-60.549	0.000	150.517	0.000	3431.870	0.000
VERT. STAB.						
FIN NO. 1	-24.471	0.000	0.000	0.000	85.860	-157.022
FIN NO. 2	-24.471	0.000	0.000	0.000	85.860	157.022
TOTAL	-48.942	0.000	0.000	0.000	171.720	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-61.634	0.000	0.000	0.001	135.666	-991.275
RIGHT ENG	-61.634	0.000	0.000	-0.001	135.666	991.275
TOTAL	-123.267	0.000	0.000	0.000	271.332	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1178.851	0.000	-13038.080	0.000	4103.943	0.000
ROTOR						
LEFT ROTOR	898.346	55.885	24.816	8885.239	-2381.659	14873.979
RIGHT ROTOR	898.346	-55.885	24.816	-8885.239	-2381.659	-14873.979
HUB SPINNER	-284.679	0.000	-7.273	0.000	659.493	0.000
TOTAL ROTOR	1512.013	0.000	42.359	0.000	-4103.825	0.000
TOTAL AIRCRAFT (BODY AXIS)	333.161	0.000	-12995.721	0.000	0.119	0.000
TOTAL AIRCRAFT (INERTIAL AXIS)	0.027	0.000	0.009	0.000	0.119	0.000

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20548.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

*** VT =280.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6455	0.0000	-0.7286	0.0000	-0.1168	0.0000
	ROTOR	0.0000	-0.0125	0.0000	-0.2235	0.0000	-0.1813	0.0000
	AIRFRM	0.0000	-0.6330	0.0000	-0.5051	0.0000	0.0645	0.0000
Q	TOTAL	0.4998	0.0000	-11.2888	0.0000	-1.1637	0.0000	0.6900
	ROTOR	0.5667	0.0000	-7.8585	0.0000	0.4703	0.0000	0.6900
	AIRFRM	-0.0669	0.0000	-3.4303	0.0000	-1.6340	0.0000	0.0000
R	TOTAL	0.0000	10.6706	0.0000	-0.1126	0.0000	-0.5139	0.0000
	ROTOR	0.0000	7.8691	0.0000	-0.2530	0.0000	-0.1215	0.0000
	AIRFRM	0.0000	2.8014	0.0000	0.1404	0.0000	-0.3924	0.0000
U	TOTAL	-0.1909	0.0000	-0.2537	0.0000	0.0179	0.0000	-0.7250
	ROTOR	-0.1767	0.0000	-0.0049	0.0000	0.0081	0.0000	-0.7250
	AIRFRM	-0.0142	0.0000	-0.2488	0.0000	0.0098	0.0000	0.0000
V	TOTAL	0.0000	-0.2419	0.0000	-0.0072	0.0000	0.0086	0.0000
	ROTOR	0.0000	-0.0527	0.0000	-0.0018	0.0000	-0.0023	0.0000
	AIRFRM	0.0000	-0.1892	0.0000	-0.0054	0.0000	0.0109	0.0000
W	TOTAL	0.0469	0.0000	-0.9332	0.0000	-0.0178	0.0000	0.0176
	ROTOR	0.0089	0.0000	-0.0519	0.0000	0.0065	0.0000	0.0176
	AIRFRM	0.0380	0.0000	-0.8813	0.0000	-0.0243	0.0000	0.0000
RPM	TOTAL	1.7387	0.0000	1.2299	0.0000	-0.1427	0.0000	7.6231
	ROTOR	1.7505	0.0000	0.0610	0.0000	-0.0817	0.0000	7.6231
	AIRFRM	-0.0118	0.0000	1.1689	0.0000	-0.0609	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2353
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2353
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.1332	0.0000	2.4045	0.0000	-0.2660	0.0000	13.6165
	ROTOR	3.1665	0.0000	0.0728	0.0000	-0.1449	0.0000	13.6165
	AIRFRM	-0.0333	0.0000	2.3317	0.0000	-0.1211	0.0000	0.0000
XLN	TOTAL	-0.0858	0.0000	-3.3007	0.0000	-1.4256	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.0858	0.0000	-3.3007	0.0000	-1.4256	0.0000	0.0000
XLT	TOTAL	0.0000	0.0044	0.0000	0.4273	0.0000	0.0547	0.0000
	ROTOR	0.0000	0.0044	0.0000	0.0250	0.0000	0.0373	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.4022	0.0000	0.0174	0.0000
XPD	TOTAL	0.0000	-2.1935	0.0000	-0.0610	0.0000	0.2989	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.1935	0.0000	-0.0610	0.0000	0.2989	0.0000

********** AIRCRAFT FLIGHT CONDITIONS **********
********** TRIM UNSUCCESSFUL - CONTROLS ARE OUT OF LIMITS **********

*** VT =300.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***

		EARTH REFERENCE UE	VE	WE
RATE	(FPS)	506.3	0.0000E+00	0.0000E+00
ACCEL	(FPS2)	-.4700E-02	-.3832E-06	-.6667E-02

BODY REFERENCE	UB	VB	WB	P	Q	R
RATE (FT OR DEG/SEC)	506.3	0.0000E+00	8.054	0.0000E+00	0.0000E+00	0.0000E+00
ACCEL(FT OR DEG/SEC2)				-.1530E-06	0.4272E-01	-.2189E-05

ATMOSPHERIC CONDITIONS	
ALTITUDE (FT)	5000.00
DENSITY ALT. (FT)	20002.41
PRESSURE ALT. (FT)	20000.00
AMBIENT TEMP (DEG-R)	248.54
OUTSIDE AIR TEMP (DEG-C)	-24.62
AIR DENSITY (SLUGS/FT3)	0.1266E-02
THETES (ND)	0.86249
DELSTD (ND)	0.45956
SIGMA PRIME (ND)	0.53282

FLIGHT PATH CONDITIONS		
CAL. AIRSPEED (KNOTS)		228.24
RATE OF DECENT (FPS)		0.00
G-LEVEL (G S)		1.00
DYN PRES (SLUGS/FT-SEC2)		162.35
ANGLE OF ATTACK (DEG)		0.911
FLIGHT PATH ANGLE (DEG)		0.000
SIDESLIP ANGLE (DEG)		0.000
ROLL ANGLE (DEG)		0.000
PITCH ANGLE (DEG)		0.911
YAW ANGLE (DEG)		0.000

INERTIAS (SLUGS-FT2)	
IXX	0.5095E+05
IXZ	1076.
IYY	0.2035E+05
IZZ	0.6717E+05

CENTER OF GRAVITY (IN)	
S.L.	298.2
B.L.	0.0000E+00
W.L.	73.59

CONTROL DISPLACEMENTS	(+)	(IN)	(PER)
COLL	(UP)	10.2499	102.50
LONG	(FWD)	5.5182	57.48
LAT	(RT)	4.8000	50.00
PEDAL	(RT)	2.5000	50.00

POWER/TORQUE	POWER (SHP)	TORQUE (FT-LBS)	BLADE GOV. PITCH (DEG)	BLADE TIP SPEED (FPS)	BLADE TIP MACH NO. (ND)
LEFT	1042.	0.1058E+05	25.22	845.2	0.8152
RIGHT	1042.	0.1058E+05	25.22	845.2	0.8152
ENGINE	871.7				

SWASH PLATE ANGLE (DEG)	LEFT ROTOR	RIGHT ROTOR
THETA0	81.0242	81.0242
B1	1.5000	1.5000
A1	0.0000	0.0000

ROTOR FLAPPING	AO (DEG)	LONG (DEG)	LAT (DEG)	FORCES - MAST AXIS THRUST (LBS)	H-FORCE (LBS)	Y-FORCE (LBS)	JET THRUST (LBS)
LEFT	1.2986	-1.7995	-0.6828	971.24	-83.74	-68.92	-68.74
RIGHT	1.2986	-1.7995	-0.6828	971.24	-83.74	-68.92	-68.74

SURFACE POSITIONS (DEG)	
ELEVATOR	3.4007
AILERON	0.0000
RUDDER	0.0000

	PROP EFFIC. (ND)	ADVANCE RATIO (ND)	INDUCED VELOCITY (FPS)	INFLOW RATIO (ND)	COEFF POWER (ND)	COEFF THRUST (ND)	COEFF DRAG (ND)
LEFT	0.8591	0.0119	1.5955	0.7504	0.002974	0.003411	0.013573
RIGHT	0.8591	0.0119	1.5955	0.7504	0.002974	0.003411	0.013573

	CDRISE (ND)	CTEL (ND)	CDALPHA (ND)	CDLIM (ND)	CDMACH (ND)	CDFACT (ND)
LEFT	-0.00655	0.01515	0.01000	0.85000	0.35000	0.20000
RIGHT	-0.00655	0.01515				

********** THIS IS NOT A VALID TRIM POINT **********

********** FORCE AND MOMENT SUMMARY (BODY AXIS) **********

****
*** VT =300.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

	X-FORCE LBS	Y-FORCE LBS	Z-FORCE LBS	ROLL FT-LBS	PITCH FT-LBS	YAW FT-LBS
FUSELAGE	-403.637	0.000	-1314.281	0.000	-7062.172	-0.003
WING						
LEFT WING	0.000	0.000	0.000	0.000	0.000	0.000
RIGHT WING	0.000	0.000	0.000	0.000	0.000	0.000
FREESTREAM	-585.226	0.000	-12150.963	0.000	4391.970	0.000
TOTAL	-585.226	0.000	-12150.963	0.000	4391.970	0.000
ENGINE PYLONS	-163.969	0.000	-2.595	0.000	360.540	0.000
HORIZ. STAB.	-65.756	0.000	309.880	0.000	6921.060	0.000
VERT. STAB.						
FIN NO. 1	-28.476	0.000	0.000	0.000	99.913	-182.721
FIN NO. 2	-28.476	0.000	0.000	0.000	99.913	182.721
TOTAL	-56.952	0.000	0.000	0.000	199.826	0.000
LANDING GEAR						
MAIN AERO.	0.000	0.000	0.000	0.000	0.000	0.000
NOSE AERO.	0.000	0.000	0.000	0.000	0.000	0.000
DYNAMIC	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL	0.000	0.000	0.000	0.000	0.000	0.000
JET THRUST						
LEFT ENG	-68.742	0.000	0.000	0.001	151.313	-1105.604
RIGHT ENG	-68.742	0.000	0.000	-0.001	151.313	1105.604
TOTAL	-137.484	0.000	0.000	0.000	302.626	0.000
GROUND EFFECT						
FUSE-HOR STAB	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL AIRFRAME	-1413.024	0.000	-13157.959	0.000	5113.852	-0.003
ROTOR						
LEFT ROTOR	972.291	70.369	83.724	9386.270	-2920.622	16195.510
RIGHT ROTOR	972.291	-70.369	83.724	-9386.270	-2920.622	-16195.510
HUB SPINNER	-326.713	0.000	-5.181	0.000	742.564	0.000
TOTAL ROTOR	1617.868	0.000	162.267	0.000	-5098.680	0.000
TOTAL AIRCRAFT (BODY AXIS)	204.844	0.000	-12995.692	0.000	15.172	-0.003
TOTAL AIRCRAFT (INERTIAL AXIS)	-1.941	0.000	2.663	0.000	15.172	-0.003

********** STABILITY DERIVATIVE MATRIX **********

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

MASS = 404.1 SLUGS, IXX = 50950.0, IYY = 20348.4, IZZ = 67168.4, DRIVEI = 824.0 SLUG-FT2

****
*** VT =300.00 KTS *** NACELLE INCIDENCE = 0.0 DEG *** AIRPLANE ***
*** GW = 13000.0 RPM = 517.00 SLCG = 298.23 WLCG = 73.59 ***
*** MAST ANGLE = 90.00 DEG ***** FLAP SETTING = 0/0 DEG ***
****

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
P	TOTAL	0.0000	-0.6991	0.0000	-0.7813	0.0000	-0.1100	0.0000
	ROTOR	0.0000	-0.0005	0.0000	-0.2453	0.0000	-0.1878	0.0000
	AIRFRM	0.0000	-0.6986	0.0000	-0.5360	0.0000	0.0778	0.0000
Q	TOTAL	0.4707	0.0000	-12.5299	0.0000	-1.2432	0.0000	0.7293
	ROTOR	0.5697	0.0000	-8.4020	0.0000	0.5172	0.0000	0.7293
	AIRFRM	-0.0990	0.0000	-4.1279	0.0000	-1.7604	0.0000	0.0000
R	TOTAL	0.0000	11.5029	0.0000	-0.1153	0.0000	-0.5257	0.0000
	ROTOR	0.0000	8.4106	0.0000	-0.2653	0.0000	-0.0939	0.0000
	AIRFRM	0.0000	3.0923	0.0000	0.1500	0.0000	-0.4318	0.0000
U	TOTAL	-0.1880	0.0000	-0.2675	0.0000	0.0190	0.0000	-0.7447
	ROTOR	-0.1714	0.0000	-0.0049	0.0000	0.0079	0.0000	-0.7447
	AIRFRM	-0.0166	0.0000	-0.2627	0.0000	0.0111	0.0000	0.0000
V	TOTAL	0.0000	-0.2644	0.0000	-0.0079	0.0000	0.0097	0.0000
	ROTOR	0.0000	-0.0577	0.0000	-0.0021	0.0000	-0.0025	0.0000
	AIRFRM	0.0000	-0.2067	0.0000	-0.0058	0.0000	0.0122	0.0000
W	TOTAL	0.0640	0.0000	-0.9999	0.0000	-0.0201	0.0000	0.0269
	ROTOR	0.0123	0.0000	-0.0586	0.0000	0.0070	0.0000	0.0269
	AIRFRM	0.0517	0.0000	-0.9413	0.0000	-0.0272	0.0000	0.0000
RPM	TOTAL	1.8408	0.0000	1.4817	0.0000	-0.1624	0.0000	8.5089
	ROTOR	1.8334	0.0000	0.0757	0.0000	-0.0865	0.0000	8.5089
	AIRFRM	0.0073	0.0000	1.4059	0.0000	-0.0758	0.0000	0.0000

CONTROL DERIVATIVE MATRIX

ALL FORCES DIVIDED BY MASS, MOMENTS BY INERTIA

		XBODY	YBODY	ZBODY	LBODY	MBODY	NBODY	TORQUE
XCOL	TOTAL	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2367
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2367
	AIRFRM	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
XTHEG	TOTAL	3.3232	0.0000	2.9426	0.0000	-0.3078	0.0000	15.3265
	ROTOR	3.3186	0.0000	0.1239	0.0000	-0.1562	0.0000	15.3265
	AIRFRM	0.0046	0.0000	2.8187	0.0000	-0.1516	0.0000	0.0000
XLN	TOTAL	-0.1142	0.0000	-3.8384	0.0000	-1.6572	0.0000	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	-0.1142	0.0000	-3.8384	0.0000	-1.6572	0.0000	0.0000
XLT	TOTAL	0.0000	0.0063	0.0000	0.4897	0.0000	0.0631	0.0000
	ROTOR	0.0000	0.0063	0.0000	0.0280	0.0000	0.0392	0.0000
	AIRFRM	0.0000	0.0000	0.0000	0.4617	0.0000	0.0239	0.0000
XPD	TOTAL	0.0000	-2.5052	0.0000	-0.0697	0.0000	0.3413	0.0000
	ROTOR	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	AIRFRM	0.0000	-2.5052	0.0000	-0.0697	0.0000	0.3413	0.0000

XV-15 TILT ROTOR DIGITAL FLIGHT SIMULATION
GW = 13000 LBS, CG = 301.2 IN, 20000 FT

CONFIGURATION:

NACELLE INCIDENCE	0.0 DEG	GEAR	0.0 % DOWN	ALTITUDE	
FLAP SETTING	0/0 DEG	STAB INCIDENCE	0.000 DEG	PRES(MSL)	20000.0 FT
ROTOR RPM	517.0 RPM	INERTIA, SLUG-FT2		DENSITY	20002.4 FT
GROSS WEIGHT	13000.0 LB	IXX 50950.	IXZ 1075.6	HEIGHT(AGL)	5000.0 FT (OGE)
C.G. F.S.	298.226 IN	IYY 20348.	IZZ 67168.	TEMP(OAT)	-24.62 DEG-C
W.L.	73.586 IN	SIGMAP	0.53282 -ND-	VSOUND	614.32 KTS
		RHO	0.0012665 SLG/FT3	WIND-V	0.00 KTS

U/VKCAS -KTS

NOTE: SYMBOL INDICATES A TRIM PROBLEM

	160.00	180.00	200.00	220.00	240.00	260.00	280.00	300.00
	118.28	133.50	148.86	164.38	180.07	195.94	211.99	228.24
AIRCRAFT CONTROL SETTINGS:						****	****	****
XLN,%	35.8100	45.4260	49.4833	52.1641	54.0119	55.4248	56.5532	57.4813
XLT,%	50.0001	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
XPD,%	50.0001	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000	50.0000
XCOL,%	69.5475	70.4176	75.7150	80.1330	88.7714	103.6044	102.4990	102.4990
A1,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
B1,DEG	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000
THETO,DEG	64.0313	66.9499	69.7434	72.3204	74.7451	76.9931	79.0834	81.0242
THOG,DEG	8.2313	11.1499	13.9434	16.5204	18.9451	21.1931	23.2834	25.2242
ELEVATOR,DEG	-6.4502	-2.0791	-0.2348	0.9837	1.8236	2.4659	2.9788	3.4007
AILERON,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
RUDDER,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROTOR:								
FAFLP,DEG	1.5736	1.1028	0.6343	0.1537	-0.3193	-0.8091	-1.3059	-1.7995
LTFLP,DEG	0.8280	0.5707	0.3823	0.1995	0.0173	-0.1885	-0.4212	-0.6828
THRUST,LB	807.02	713.36	709.56	723.04	772.14	829.86	897.51	971.24
CT	0.0028	0.0025	0.0025	0.0025	0.0027	0.0029	0.0032	0.0034
H-FORCE,LB	228.52	197.87	162.15	122.04	78.459	29.410	-24.819	-83.736
Y-FORCE,LB	-27.353	-26.807	-27.863	-31.105	-36.636	-44.711	-55.460	-68.918
HORSEPOWER	440.85	453.66	508.79	574.94	669.20	777.25	902.01	1041.9
Q,FT-LB	4478.5	4608.6	5168.7	5840.7	6798.2	7895.9	9163.4	10585.
CP	0.0013	0.0013	0.0015	0.0016	0.0019	0.0022	0.0026	0.0030
RPM,ROTOR	517.00	517.00	517.00	517.00	517.00	517.00	517.00	517.00
WI,FT/SEC	2.4821	1.9577	1.7553	1.6273	1.5928	1.5791	1.5834	1.5955
MU	0.0801	0.0642	0.0515	0.0410	0.0323	0.0246	0.0179	0.0119
LAMDA	0.3945	0.4471	0.4987	0.5495	0.6000	0.6502	0.7004	0.7504
AIRCRAFT ATTITUDES:								
ALPHAF,DEG	11.5751	8.2249	5.9228	4.2804	3.0912	2.1785	1.4684	0.9114
PITCH,DEG	11.5751	8.2249	5.9228	4.2804	3.0912	2.1785	1.4684	0.9114
GAMMA,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
BETAF,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
ROLL,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

YAW,DEG	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

FLIGHT CONDITIONS:

DYNAMIC PRES	46.1792	58.4456	72.1551	87.3076	103.9033	121.9421	141.4240	162.3489
MACH NUMBER	0.2605	0.2930	0.3256	0.3581	0.3907	0.4232	0.4558	0.4883
VT,KNOTS	160.0000	180.0000	200.0000	220.0000	240.0000	260.0000	280.0000	300.0000
VKCAS,KNOTS	118.2816	133.4992	148.8620	164.3823	180.0711	195.9383	211.9922	228.2397
HP-ENG	484.01	497.77	557.06	628.18	729.53	830.90	851.32	871.65

SYMBOL DEFINITIONS:

++++	FORCES AND MOMENTS UNBALANCED	@@@@	ROTOR STALLED
****	CONTROLS OUT OF LIMITS	////	WING STALLED
####	ROTOR ENDURANCE LIMIT EXCEEDED		

CPU TIME SINCE TIMEX CALLED = 0.0020 MIN TOTAL TIME USED IN THIS RUN = 0.4862 MIN

TIME: 23:22:23
DATE: 5MAY'89

TWIST AT 3/4 RADIUS IS 34.5000

TIME OF DAY - 23:22:23

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15. Supplementary Notes

16. Abstract The effective use of rotorcraft simulation as a design tool is exemplified by the XV-15 Tilt-Rotor Research Aircraft program. From inception through issuance of the request for proposal and throughout the program design and flight test phases, simulation has complemented all aspects of XV-15 development. More than ten simulation periods have provided design guidance and pilot training in the areas of control concepts, cockpit configuration, handling qualities, pilot workload, failure effects, recovery procedures, and flight boundary problems and procedures. During 1983 at NASA Ames Research Center (ARC), approximately five months were devoted to developing and validating a generic tilt-rotor simulation (GTRS) using the XV-15 flight test data base as a validation benchmark. Numerous civil and military tilt-rotor design concepts and issues were evaluated by researchers from the government and private industry. This work has aided in providing a technology base for the civil certification of tilt rotors and for the Joint Services Advanced Vertical Lift Aircraft (JVX) program (subsequently designated the Bell-Boeing MV-22). Results from this simulation effort, using the ARC Vertical Motion Simulator (VMS), covered a broad range of topics, including the importance of simulation fidelity and validation. Subsequent work, through 1988, has also been conducted to further improve the GTRS mathematical model and correlate the model with available flight test data. This report summarizes much of the efforts described above with particular emphasis on the lastest effort, the GTRS mathematical model and its correlation with flight test data.

17. Key Words (Suggested by Author(s))

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XV-15
GTRSIM
Rotorcraft Simulation
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Simulation

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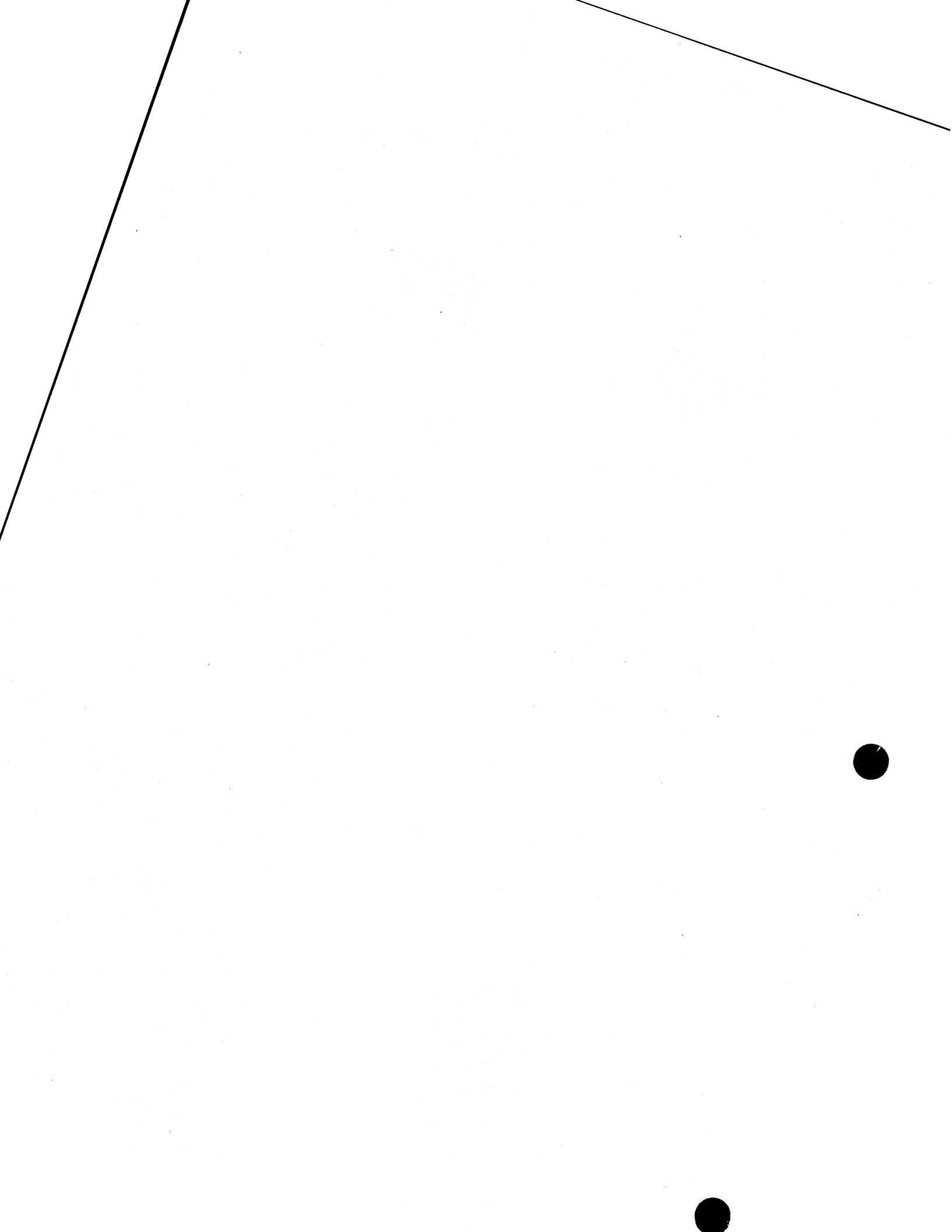
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