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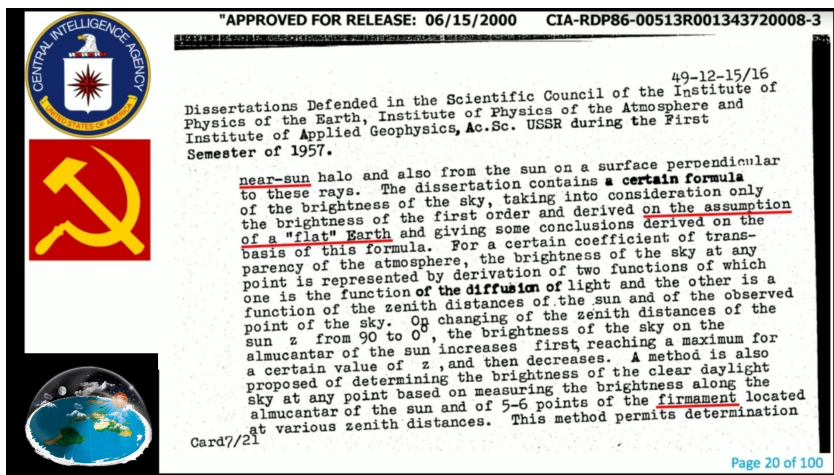
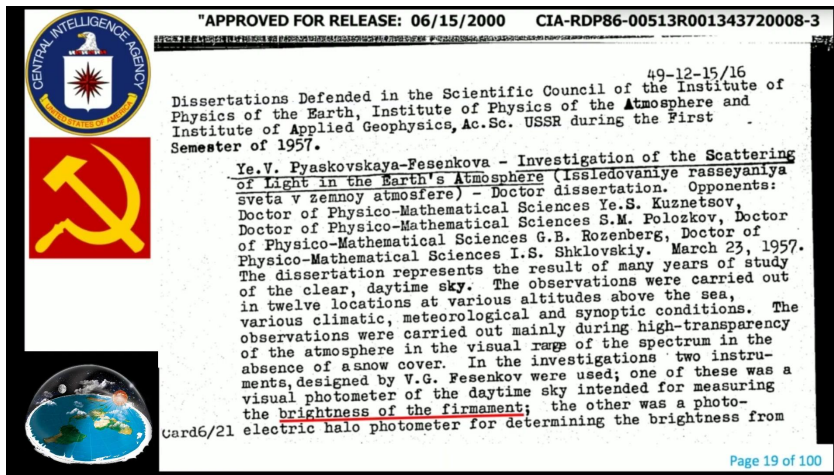
### (1) Dissertations Defended in the Scientific Council of the Institute of Physics of the Earth

Pages: Cover Page, 19, 20

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Government Admits Flat Earth: Doc #1	
"APPROVED FOR RELEASE: 06/15/2000 CIA-RDP86-00513R001343720008-3"	
 <b>Title:</b> Dissertations Defended in the Scientific Council of the Institute of Physics of the Earth <b>Author:</b> Kirillov, F.A. <b>URL:</b> <a href="https://www.cia.gov/library/readingroom/docs/CIA-RDP86-00513R001343720008-3.pdf">https://www.cia.gov/library/readingroom/docs/CIA-RDP86-00513R001343720008-3.pdf</a>	<b>Name:</b> PYASKOVSKAYA-FESENKOVA, Yevgeniya Vladimirovna
	<b>Dissertation:</b> Study of the dispersion of light in the earth' atmosphere
	<b>Degree:</b> Doc Phys-Math Sci
	<b>Affiliation:</b> Astrophysical Inst of Acad Sci Kazakh SSR
	<b>Defense Date, Place:</b> 22 Mar 57, Joint Council of Inst of Physics of the Earth, Inst of Physics of the Atmosphere, and Inst of Applied Geophysics, Acad Sci USSR
<b>Certification Date:</b> 21 Sep 57	<b>Source:</b> BMVO 22/57

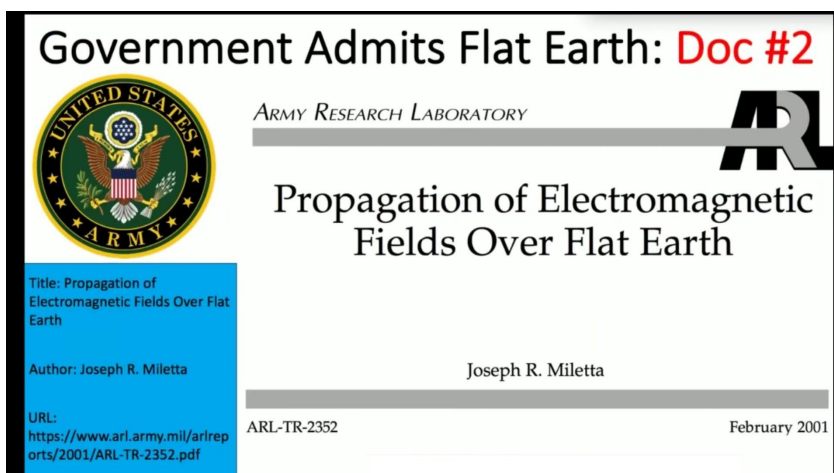




## (2) Propagation of Electromagnetic Fields Over Flat Earth

Pages: Cover Page, 7, 17, 18, 28, 35

<https://www.arl.army.mil/arlreports/2001/ARL-TR-2352.pdf>





## 1. Introduction

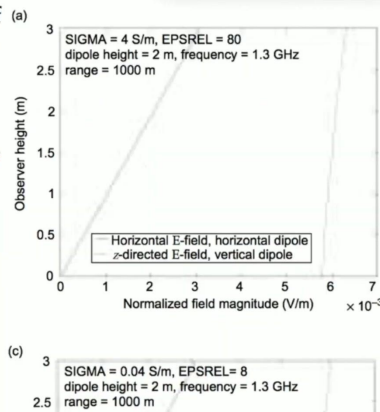


Effective military or law-enforcement applications of high-power microwave (HPM) systems in which the HPM system and the target system are on or near the ground or water require that the microwave power density on target be maximized. The power density at the target for a given source will depend on the destructive and constructive scattering of the fields as they propagate to the target. Antenna design for an HPM system includes addressing the following questions about field polarization: Should the fields the transmitting antenna produces be vertically, horizontally, or circularly polarized? Which polarization maximizes the power density on target? (The question of which polarization best couples to the target is beyond the scope of this report.) While this report does not completely answer these questions, it addresses the interaction of the radiated electromagnetic fields with earth ground. It is assumed that the transmitting antenna and the target (or receiver) are located above, but near the surface of a flat idealized earth (constant permittivity,  $\epsilon$ , and conductivity,  $\sigma$ ) ground. First an ideal vertical dipole (oriented along the  $z$ -axis perpendicular to the ground plane) is addressed. The horizontal dipole (parallel to the ground plane) follows.

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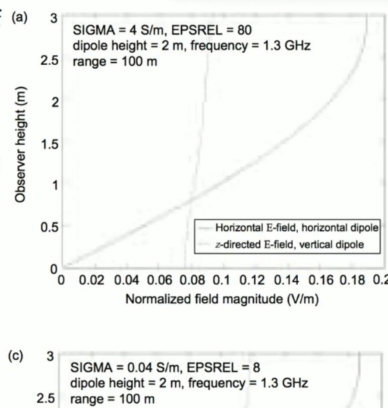
Figure 6. Comparison of principal fields from an ideal dipole oriented perpendicular and horizontal to a homogeneous flat earth. In each case, dipole is placed 2 m above ground plane and observer or target is 1000 m down range: (a) sea water, (b) wet earth, (c) dry earth, (d) lake water, and (e) dry sand.




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Figure 7. Comparison of principal fields from an ideal dipole oriented perpendicular and horizontal to a homogeneous flat earth. In each case, dipole is placed 2 m above ground plane and observer or target is 100 m down range: (a) sea water, (b) wet earth, (c) dry earth, (d) lake water, and (e) dry sand.




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## Plot m-File for Fields

%  
 % This m-file plots the fields over a conductive flat earth produced by an ideal  
 % dipole placed a distance  $d$  above the earth. It compares the results from  
 % a vertical and horizontal dipole.  
 %  
 %  
 % Establish the problem conditions  
 %  
 %  
 % EPSREL- Relative dielectric constant; SIGMA- Earth conductivity (S/m)



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## REPORT DOCUMENTATION PAGE

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4. TITLE AND SUBTITLE Propagation of Electromagnetic Fields Over <u>Flat Earth</u>		5. FUNDING NUMBERS DA PR: AH94 PE: 62705A
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Doc #2: Page 35 of 35

### (3) An Energy Budget Model to Calculate the Low Atmosphere Profiles of Effective Sound Speed at Night


Pages: Cover Page, 10, 16

<https://www.arl.army.mil/arlreports/2003/ARL-MR-563.pdf>

## Government Admits Flat Earth: Doc #3



ARMY RESEARCH LABORATORY



**An Energy Budget Model to Calculate the Low Atmosphere Profiles of Effective Sound Speed at Night**

by Arnold Tunick

Title: An Energy Budget Model to Calculate the Low Atmosphere Profiles of Effective Sound Speed at Night

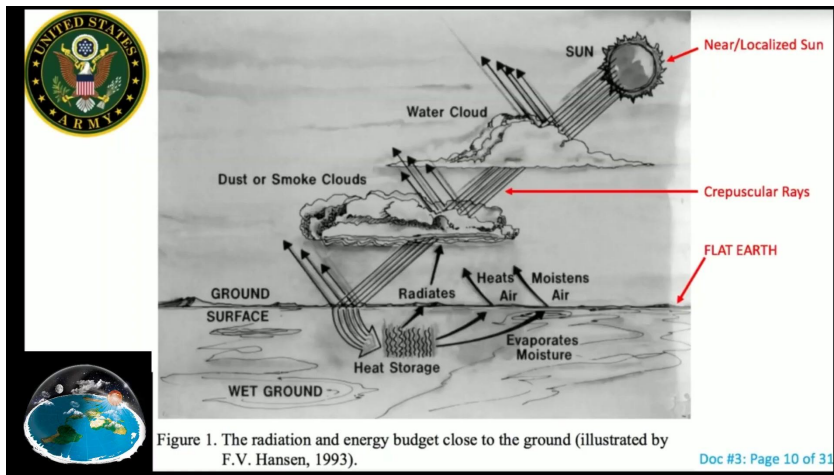
Author: Arnold Tunick

URL:  
<https://www.arl.army.mil/arlreports/2003/ARL-MR-563.pdf>

ARL-MR-563

May 2001





**3.2 Approximation of Short Range Acoustic Attenuation**

To briefly examine short range acoustic attenuation at night, we use the low atmosphere profiles of wind speed, temperature, and relative humidity (shown before) as input to a flat earth, non-turbulent acoustic propagation model called the Windows (version) Scanning Fast Field Program (WSCAFFIP). WSCAFFIP is a numerical code developed for assessing environmental effects on short range acoustic attenuation (7,38). WSCAFFIP determines acoustic attenuation as relative sound pressure loss with range and azimuth for a given frequency and source-to-receiver geometry. WSCAFFIP contains propagation algorithms to represent the effects of atmospheric refraction, diffraction, absorption, and reflection (ground impedance) on acoustic transmission. Table 3 lists the model parameters for an initial approximation of short range acoustic attenuation over an open grass-covered ( $h = 0.5$  m) field. Figures 4 and 5 show the WSCAFFIP results corresponding to the modeled profiles of effective sound speed generated by the alternate (quartic) model.

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#### (4) Computationally Efficient Algorithms for Estimating the Angle of Arrival of Helicopters Using Acoustic Arrays

Pages: Cover Page, 17, 30, 31, 35

<https://www.arl.army.mil/arlreports/2009/ARL-TR-4998.pdf>

**Government Admits Flat Earth: Doc #4**

**ARMY RESEARCH LABORATORY**

**Computationally Efficient Algorithms for Estimating the Angle of Arrival of Helicopters Using Acoustic Arrays**

by Geoffrey Goldman

ARL-TR-4998 September 2009

Title: Computationally Efficient Algorithms for Estimating the Angle of Arrival of Helicopters Using Acoustic Arrays

Author: Geoffrey Goldman

URL: <https://www.arl.army.mil/arlreports/2009/ARL-TR-4998.pdf>



### 3.3 Multipath Model

Figure 6 illustrates a simple model for multipath, which is based upon the signal having a single bounce on a flat Earth with propagation that is described by ray tracing for signals in the far-field. The microphone is at a height  $H$  above the ground, and a complex reflection coefficient that is potentially frequency dependent is given by  $\rho(\omega)$ , which can be approximated using empirical data. The signal propagating along the direct and indirect path sum to generate the signal measured at the microphone.



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and letting the phase vary from  $-180^\circ$  to  $180^\circ$ . The phase that produced the match was selected. The results are shown in figure 17 for a single spectral peak for frequencies between 21–27 Hz for a reflection coefficient with an amplitude of 1. The results based upon harmonics at higher frequencies were almost random and were not included. The results for frequencies below 27 Hz are reasonably consistent, but not close to the anticipated result of a reflection coefficient phase of  $0^\circ$ . The estimated phases of the reflection coefficients have a dependency on range. This may be caused by a violation of the assumption of the flat Earth model.



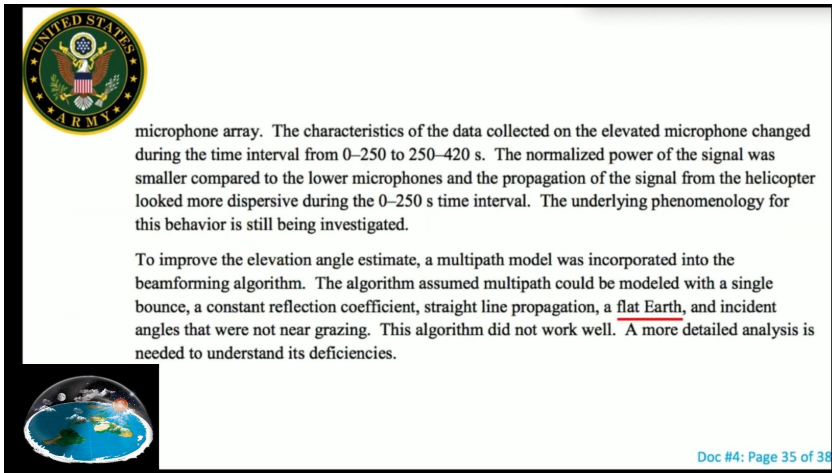
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The beamforming algorithm with multipath algorithm was rerun using the average of the computed reflection coefficient for two spectral peaks between 9 to 27 Hz. This is a more realistic simulation compared to the previous calculations. The results are shown in figure 19. These results are poor at all times and indicate that the model used to describe the propagation of the signal is not adequate. The assumptions of straight-line propagation, constant reflection coefficient, or reflection off a flat Earth may not be valid.



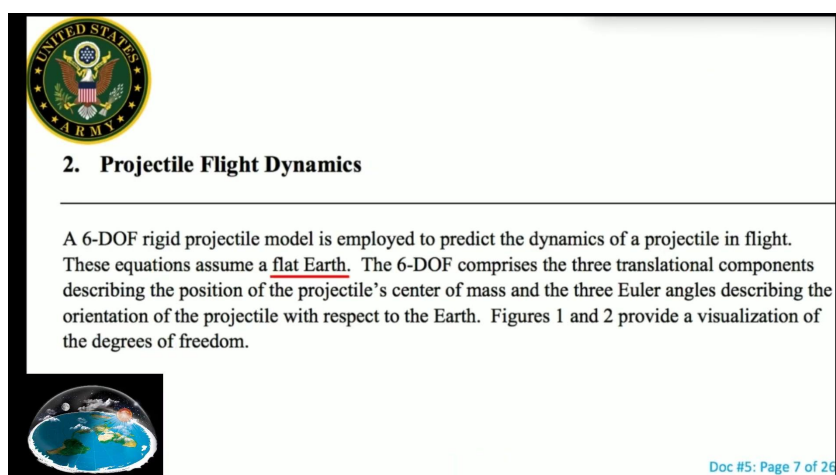
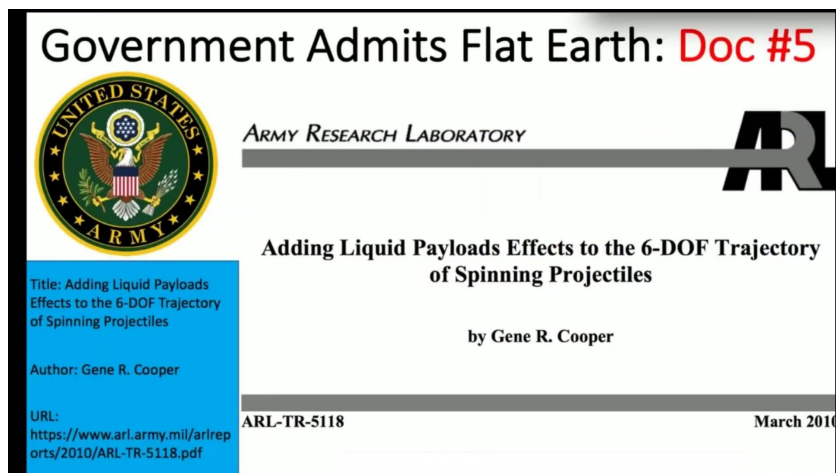
Doc #4: Page 31 of 38



## (5) Adding Liquid Payloads Effects to the 6-DOF Trajectory of Spinning Projectiles

Page: Cover Page, 7

<https://www.arl.army.mil/arlreports/2010/ARL-TR-5118.pdf>



## (6) Trajectory Prediction of Spin-Stabilized Projectiles With a Steady Liquid Payload

Page: Cover Page, 10

<https://www.arl.army.mil/arlreports/2011/ARL-TR-5810.pdf>

## Government Admits Flat Earth: Doc #6



ARMY RESEARCH LABORATORY



### Trajectory Prediction of Spin-Stabilized Projectiles With a Steady Liquid Payload

by Gene R. Cooper

Title: Trajectory Prediction of Spin-Stabilized Projectiles With a Steady Liquid Payload

Author: Gene R. Cooper

URL:  
<https://www.arl.army.mil/arlreports/2011/ARL-TR-5810.pdf>

ARL-TR-5810

November 2011



### 2. Projectile Flight Dynamic Model With a Liquid Payload

A typical 6-DOF rigid projectile model is employed to predict the dynamics of a projectile in flight. These equations assume a flat Earth. The well-known 6-DOF states comprise the three translational components describing the position of the projectile's center of mass and the three Euler angles describing the orientation of the projectile with respect to the Earth. Figures 1 and 2 provide a visualization of the degrees of freedom.



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## (7) Derivation and Definition of a Linear Aircraft Model

Pages: Cover Page, 6, 35, 55, 102

[https://www.nasa.gov/centers/dryden/pdf/88104main\\_H-1391.pdf](https://www.nasa.gov/centers/dryden/pdf/88104main_H-1391.pdf)

## Government Admits Flat Earth: Doc #7



NASA  
Reference  
Publication  
1207

August 1988

### Derivation and Definition of a Linear Aircraft Model

Title: Derivation and Definition of a Linear Aircraft Model

Author: Eugene L. Duke, Robert F. Antoniewicz, and Keith D. Krambeer

URL:  
[https://www.nasa.gov/centers/dryden/pdf/88104main\\_H-1391.pdf](https://www.nasa.gov/centers/dryden/pdf/88104main_H-1391.pdf)

Eugene L. Duke,  
Robert F. Antoniewicz,  
and Keith D. Krambeer





## INTRODUCTION

The need for linear models of aircraft for the analysis of vehicle dynamics and control law design is well known. These models are widely used, not only for computer applications but also for quick approximations and desk calculations. Whereas the use of these models is well understood and well documented, their derivation is not. The lack of documentation and, occasionally, understanding of the derivation of linear models is a hindrance to communication, training, and application.

This report details the development of the linear model of a rigid aircraft of constant mass, flying over a flat, nonrotating earth. This model consists of a state equation and an observation (or measurement) equation. The system equations have been broadly formulated to accommodate a wide variety of applications. The linear state equation is derived from the nonlinear six-degree-of-freedom equations of motion. The linear observation equation is derived from a collection of nonlinear equations representing state variables, time derivatives of state variables, control inputs, and flightpath, air data, and other parameters. The linear model is developed about a nominal trajectory that is general.

Whereas it is common to assume symmetric aerodynamics and mass distribution, or a straight and level trajectory, or both (Clancy, 1975; Dommasch and others, 1967; Etkin, 1972; McRuer and others, 1973; Northrop Aircraft, 1952; Thelander, 1965), these assumptions limit the generality of the linear model. The principal contribution of this report is a solution of the general problem of deriving a linear model of a rigid aircraft without making these simplifying assumptions. By defining the initial conditions (of the nominal trajectory) for straight and level flight and setting the asymmetric aerodynamic and inertia terms to zero, one can easily obtain the more traditional linear models from the linear model derived in this report.



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## 3 CONCLUDING REMARKS

This report derives and defines a set of linearized system matrices for a rigid aircraft of constant mass, flying in a stationary atmosphere over a flat, nonrotating earth. Both generalized and standard linear system equations are derived from nonlinear six-degree-of-freedom equations of motion and a large collection of nonlinear observation (measurement) equations.

This derivation of a linear model is general and makes no assumptions on either the reference (nominal) trajectory about which the model is linearized or the symmetry of the vehicle mass and aerodynamic properties.

Ames Research Center  
Dryden Flight Research Facility  
National Aeronautics and Space Administration  
Edwards, California, January 8, 1987



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### D.2 Evaluation of the Derivatives of the Time Derivatives of the State Variables

The generalized derivatives of the time derivatives of the state variables are defined in appendix C, equations (C-1) to (C-15). In this section, these generalized derivatives are evaluated in terms of the stability and control derivatives, primitive terms, and the state, time derivative of state, and control variables. In this section, the notation  $\partial(\dot{x}_i)/\partial x_j$  is used to represent the more correct notation  $\partial f_i/\partial x_j$  that is employed in the discussion at the beginning of section 3. This notation is used because there is no convenient notation available to express these quantities clearly—particularly not the usual notation employed in flight mechanics texts such as Etkin (1972) and McRuer and others (1973). The notation that defines quantities such as  $L_p = \partial(\dot{p})/\partial p$  and  $M_q = \partial(\dot{q})/\partial q$  is misleading in this context because the definitions of those terms (such as  $L_p$ ,  $M_q$ ) are based on assumptions of symmetric mass distributions, symmetric aerodynamics, and straight and level flight, and additionally do not include derivatives with respect to atmospheric quantities.




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16. Abstract			
<p>This report documents the derivation and definition of a linear aircraft model for a rigid aircraft of constant mass flying over a flat, nonrotating earth. The derivation makes no assumptions of reference trajectory or vehicle symmetry. The linear system equations are derived and evaluated along a general trajectory and include both aircraft dynamics and observation variables.</p>			
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Unclassified	Unclassified	108	A06

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\*For sale by the National Technical Information Service, Springfield, VA 22161-2171.


NASA-Langley, 1981  
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## (8) General Equations of Motion for a Damaged Asymmetric Aircraft

Page: Cover Page, 2

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20070030307.pdf>



# Government Admits Flat Earth: Doc #8


<https://ntrs.nasa.gov/search.jsp?R=20070030307> 2019-07-03T20:22:50+00:00

## General Equations of Motion for a Damaged Asymmetric Aircraft

Barton J. Bacon\* and Irene M. Gregory†  
NASA Langley Research Center, Hampton, VA, 23681


**Title:** General Equations of Motion for a Damaged Asymmetric Aircraft  
**Author:** Barton J. Bacon and Irene M. Gregory  
**URL:**  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20070030307.pdf>

There is a renewed interest in dynamic characteristics of damaged aircraft both in order to assess survivability and to develop control laws to enhance survivability. This paper presents a set of flight dynamics equations of motion for a rigid body not necessarily referenced to the body's center of mass. Such equations can be used when the body loses a portion of its mass and it is desired to track the motion of the body's previous center of mass/reference frame now that the mass center has moved to a new position. Furthermore, results for equations presented in this paper and equations in standard aircraft simulations are compared for a scenario involving a generic transport aircraft configuration subject to wing damage.



## II. Rigid Body Equations of Motion Referenced to an Arbitrary Fixed Point on the Body

There are several approaches that can be used to develop the general equations of motion. The one selected here starts with Newton's laws applied to a collection of particles defining the rigid body (any number of dynamics or physics books can serve as references, e.g. reference 2). In this paper, the rigid body equations of motion over a flat non-rotating earth are developed that are not necessarily referenced to the body's center of mass. Such equations will be used in the next section when the body loses a portion of its mass and it is desired to track the motion of the body's previous center of mass/reference frame now that the mass center has moved to a new position



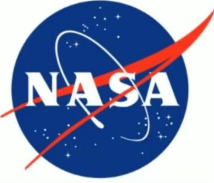
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## (9) Predicted Performance of a ThrustEnhanced SR-71 Aircraft with an External Payload

Page: Cover Page, 10

[https://www.nasa.gov/centers/dryden/pdf/88507main\\_H-2179.pdf](https://www.nasa.gov/centers/dryden/pdf/88507main_H-2179.pdf)

## Government Admits Flat Earth: Doc #9



NASA Technical Memorandum 104330

### Predicted Performance of a Thrust-Enhanced SR-71 Aircraft with an External Payload

Timothy R. Conners

June 1997



National Aeronautics and Space Administration

Title: Predicted Performance of a Thrust-Enhanced SR-71 Aircraft with an External Payload

Author: Timothy R. Conners

URL:  
[https://www.nasa.gov/centers/dryden/pdf/88507main\\_H-2179.pdf](https://www.nasa.gov/centers/dryden/pdf/88507main_H-2179.pdf)



Lockheed SR-71 Blackbird / Top speed

2,193 mph



The DPS equations of motion use four assumptions that simplify the program while maintaining its fidelity for most maneuvers and applications: point-mass modeling, nonturbulent atmosphere, zero side forces, and a nonrotating Earth. The primary advantages of us-



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## (10) Derivation of a Point-Mass Aircraft Model used for Fast-Time Simulation

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[https://www.mitre.org/sites/default/files/publications/pr\\_15-1318-derivation-of-point-mass-aircraft-model-used-for-fast-time-simulation.pdf](https://www.mitre.org/sites/default/files/publications/pr_15-1318-derivation-of-point-mass-aircraft-model-used-for-fast-time-simulation.pdf)

## Government Admits Flat Earth: Doc #10



MITRE

### Derivation of a Point-Mass Aircraft Model used for Fast-Time Simulation

MITRE Technical Report

Dr. Lesley A. Weitz


April 2015

Title: Derivation of a Point-Mass Aircraft Model used for Fast-Time Simulation

Author: Dr. Lesley A. Weitz

URL:  
[https://www.mitre.org/sites/default/files/publications/pr\\_15-1318-derivation-of-point-mass-aircraft-model-used-for-fast-time-simulation.pdf](https://www.mitre.org/sites/default/files/publications/pr_15-1318-derivation-of-point-mass-aircraft-model-used-for-fast-time-simulation.pdf)


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Org. No.: F084  
Project No.: 02158B02-AS  
Contract No.: 2  
FWSR Reference: 2-6.1.1  
"Development of the FWSR and the FWSR MOPS"  
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McLean, VA



## 2 Equations of Motion

### 2.1 Reference Frames

Assuming a flat, non-rotating Earth, an inertial reference frame  $N$  is defined with the  $\hat{n}_1$  axis aligned with east, the  $\hat{n}_2$  axis aligned with north, and the  $\hat{n}_3$  axis pointing up from the Earth.





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## (11) A Method for Reducing The Sensitivity of Optimal Nonlinear Systems to Parameter Uncertainty

Page: Cover Page, 14

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19710018599.pdf>

# Government Admits Flat Earth: Doc #11

**NASA TECHNICAL NOTE**  
NASA TN D-6218  
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**Title:** A Method for Reducing The Sensitivity of Optimal Nonlinear Systems to Parameter Uncertainty



**Author:** Jarrell R. Elliott (Langley Research Center) and William F. Teague (University of Kansas)

**URL:**  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19710018599.pdf>

**A METHOD FOR REDUCING THE SENSITIVITY OF OPTIMAL NONLINEAR SYSTEMS TO PARAMETER UNCERTAINTY**

by  
Jarrell R. Elliott  
Langley Research Center  
and  
William F. Teague  
University of Kansas


NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • JUNE 1971

### Problem Statement

The example problem is a fixed-time problem in which it is required to determine the thrust-attitude program of a single-stage rocket vehicle starting from rest and going to specified terminal conditions of altitude and vertical velocity which will maximize the final horizontal velocity. The idealizing assumptions made are the following:

- (1) A point-mass vehicle
- (2) A flat, nonrotating earth
- (3) A constant-gravity field,  $g = 9.8 \text{ m/sec}^2$  (32.2 ft/sec<sup>2</sup>)
- (4) Constant thrust and mass-loss rate
- (5) A nonlifting body in a nonvarying atmosphere with a constant drag parameter  $K_D = \frac{1}{2} \rho C_D S$ , where  $S$  is the frontal surface area.



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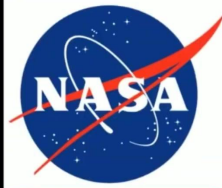
## (12) Calculation of Wind Compensation for Launching of Unguided Rockets

Pages: Cover Page, 8, 10

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20040008097.pdf>



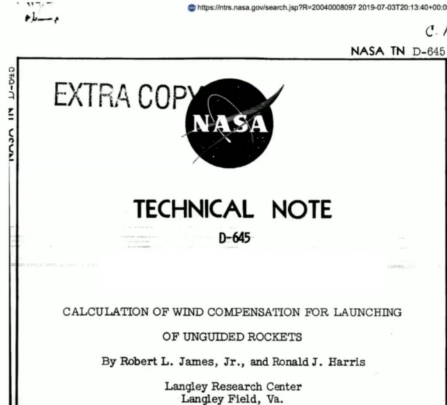
## Government Admits Flat Earth: Doc #12



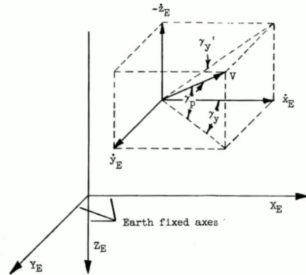
Title: Calculation of Wind Compensation for Launching of Unguided Rockets

Author: Robert L. James, Jr., and Ronald J. Harris

URL:  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20040008097.pdf>



A trajectory simulation incorporating the above requirements is presented in reference 8. In addition to the above requirements, this simulation assumes a vehicle with six degrees of freedom and aerodynamic symmetry in roll and the missile position in space is computed relative to a flat nonrotating earth. This trajectory simulation was programmed on the IBM 704 electronic data processing machine and is the basis for all trajectory computations made in this paper.



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## (13) User's Manual for LINEAR, a FORTRAN Program to Derive Linear Aircraft Models (2768)

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## Government Admits Flat Earth: Doc #13



Title: User's Manual for LINEAR, a FORTRAN Program to Derive Linear Aircraft Models (2768)

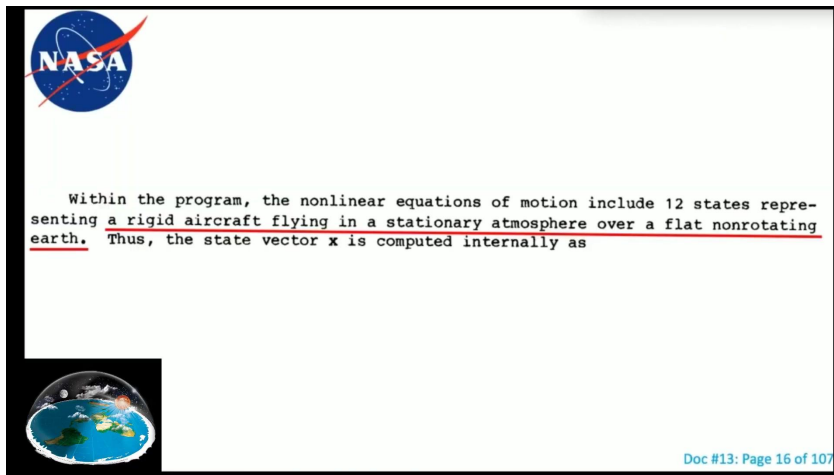
Author: Eugene L. Duke, Brian P. Patterson, and Robert F. Antoniewicz

URL:  
[https://www.nasa.gov/centers/dryden/pdf/88072main\\_H-1259.pdf](https://www.nasa.gov/centers/dryden/pdf/88072main_H-1259.pdf)

NASA  
 Technical  
 Paper  
 2768  
 December 1987

User's Manual for  
 LINEAR, a FORTRAN  
 Program to Derive  
 Linear Aircraft Models

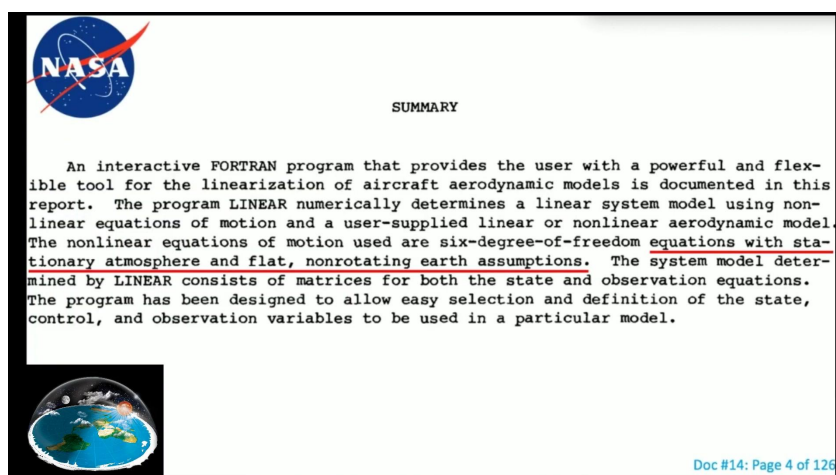
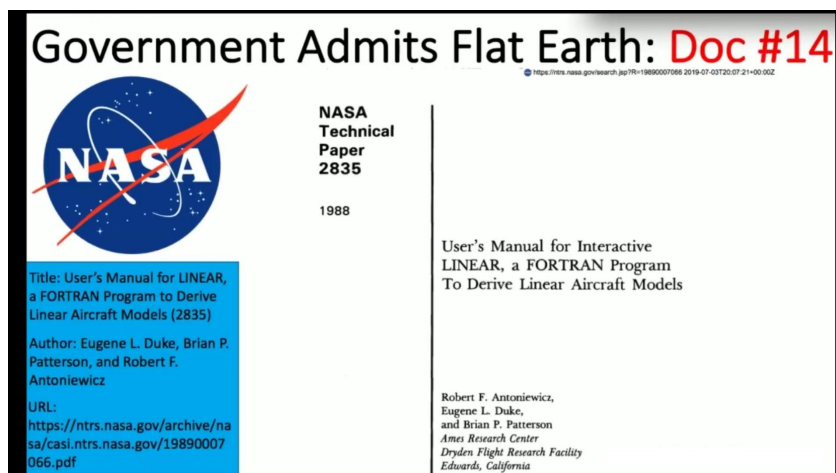
Eugene L. Duke,  
 Brian P. Patterson,  
 and Robert F. Antoniewicz




#### (14) User's Manual for LINEAR, a FORTRAN Program to Derive Linear Aircraft Models (2835)

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[https://www.nasa.gov/centers/dryden/pdf/88112main\\_H-1443.pdf](https://www.nasa.gov/centers/dryden/pdf/88112main_H-1443.pdf)





16. Abstract

An interactive FORTRAN program that provides the user with a powerful and flexible tool for the linearization of aircraft aerodynamic models is documented in this report. The program LINEAR numerically determines a linear system model using nonlinear equations of motion and a user-supplied linear or nonlinear aerodynamic model. The nonlinear equations of motion used are six-degree-of-freedom equations with stationary atmosphere and flat, nonrotating earth assumptions. The system model determined by LINEAR consists of matrices for both the state and observation equations. The program has been designed to allow easy selection and definition of the state, control, and observation variables to be used in a particular model.

17. Key Words (Suggested by Author(s))  
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Computer program  
Control law design  
Linearization

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Unclassified - Unlimited

Subject category 66

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Unclassified

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Unclassified

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124

22. Price  
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NSA FORM 1628 OCT 66  
For sale by the National Technical Information Service, Springfield, Virginia 22161  
NASA-Langley, 1988

Doc #14: Page 126 of 126


## (15) Determination of Angles of Attack and Sideslip from Radar Data and a Roll-Stablized Platform

Page: Cover Page, 2

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19720012071.pdf>

# Government Admits Flat Earth: Doc #15

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NASA TECHNICAL MEMORANDUM

NASA TM X-2514

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KIRTLAND AFB, N.M.

DETERMINATION OF ANGLES OF ATTACK  
AND SIDESLIP FROM RADAR DATA  
AND A ROLL-STABILIZED PLATFORM

by John S. Preisser  
Langley Research Center  
Hampton, Va. 23365


[www.FlatEarthDoctrine.com](http://www.FlatEarthDoctrine.com)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION • WASHINGTON, D. C. • MARCH 1972

Title: Determination of Angles of Attack and Sideslip from Radar Data and a Roll-Stabilized Platform

Author: John S. Preisser

URL:  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19720012071.pdf>



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1. Report No. NASA TM X-2514	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle DETERMINATION OF ANGLES OF ATTACK AND SIDESLIP FROM RADAR DATA AND A ROLL-STABILIZED PLATFORM	5. Report Date March 1972	6. Performing Organization Code
7. Author(s) John S. Preisser	8. Performing Organization Report No. L-7886	9. Work Unit No. 117-07-04-01
10. Performing Organization Name and Address NASA Langley Research Center Hampton, Va. 23365	11. Contract or Grant No.	12. Type of Report and Period Covered Technical Memorandum
13. Sponsoring Agency Name and Address National Aeronautics and Space Administration Washington, D.C. 20546	14. Sponsoring Agency Code	
15. Supplementary Notes		
16. Abstract Equations for angles of attack and sideslip relative to both a rolling and nonrolling body axis system are derived for a flight vehicle for which radar and gyroscopic-attitude data are available. The method is limited, however, to application where a flat, nonrotating earth may be assumed. The gyro considered measures attitude relative to an inertial reference in an Euler angle sequence. In particular, a pitch, yaw, and roll sequence is used as an example in the derivation. Sample calculations based on flight data are presented to illustrate the method. Results obtained with the present gyro method are compared with another technique that uses onboard-camera data.		

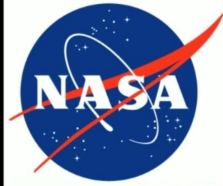
Doc #15: Page 2 of 23

## (16) U.S. Standard Atmosphere (1962)

Page: Cover Page, 22

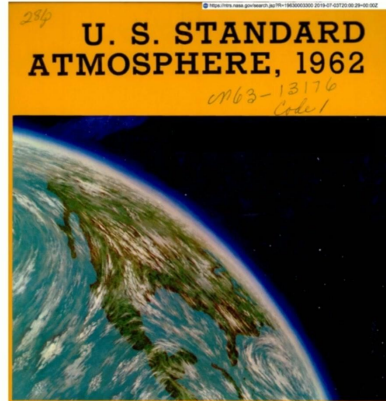
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19630003300.pdf>

## Government Admits Flat Earth: Doc #16



Title: U.S. Standard Atmosphere (1962)

URL:  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19630003300.pdf>



For the accuracy required in this document, it suffices to treat the surface  $\Phi=0$  as an ellipsoid whose flattening (ellipticity) is

$$f = 1 - \frac{b}{a} = \frac{1}{298.32} \quad \text{I.2.4-(13)}$$



Doc #16: Page 22 of 298

## (17) An Aircraft Model for the AIAA Controls Design Challenge

Page: Cover Page, 13

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## Government Admits Flat Earth: Doc #17



Title: An Aircraft Model for the AIAA Controls Design Challenge

Author: Randal W. Brumbaugh

URL:  
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**An Aircraft Model for the AIAA Controls Design Challenge**

Randal W. Brumbaugh

Contract NAS 2-12722  
December 1991


**NASA**  
National Aeronautics and  
Space Administration





## Equations of Motion and Atmospheric Model

The nonlinear equations of motion used in this model are general six-degree-of-freedom equations representing the flight dynamics of a rigid aircraft flying in a stationary atmosphere over a flat, nonrotating Earth. These equations of motion were derived by Etkin, and the derivation is detailed in Duke, Antoniewicz, and Krambeer. The equations for each variable in the state vector are given in the following.



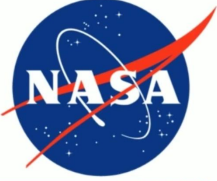
Doc #17: Page 13 of 19

### (18) Investigation of Aircraft Landing in Variable Wind Fields

Page: Cover Page, 14

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19790005472.pdf>

## Government Admits Flat Earth: Doc #18



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Investigation of Aircraft Landing  
in Variable Wind Fields

Walter Frost and Kapuluru Ravikumar Reddy

CONTRACT NAS8-29584  
DECEMBER 1978

Title: Investigation of Aircraft Landing in Variable Wind Fields  
Author: Walter Frost and Kapuluru Ravikumar Reddy  
URL: <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19790005472.pdf>




## AIRCRAFT LANDING MODEL

### 1. Equations of Motion

The two-dimensional model for aircraft motion presented in this section follows the general form developed by Frost [12]. It accounts for both vertical and horizontal mean wind components having both time and spatial variations.

The aircraft trajectory model employed in this study was derived based on the following assumptions:

- The earth is flat and non-rotating.



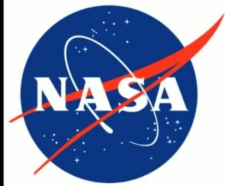
Doc #18: Page 14 of 98

### (19) A Mathematical Model of the CH-53

Page: Cover Page, 25

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19810003557.pdf>

## Government Admits Flat Earth: Doc #19



NASA Technical Memorandum TM 81238

(NASA-TM-81238) A MATHEMATICAL MODEL OF THE  
CH-53 HELICOPTER (NASA) 60 p HC A04/MP A01 W81-12365  
CSCL 01C Unclas  
G3/05 29424

Title: A Mathematical Model of the CH-53 Helicopter

Author: William R. Sturgeon,  
James D. Phillips, Ames  
Research Center, Moffett Field,  
California

URL:  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19810003557.pdf>

### A Mathematical Model of the CH-53 Helicopter

William R. Sturgeon  
James D. Phillips, Ames Research Center, Moffett Field, California



#### Equations of Motion

The helicopter equations of motion are given in body axes with respect to a flat, nonrotating Earth. The helicopter is considered a rigid body with mass symmetry about the  $x_h - z_h$  plane. The effects due to the engine angular momentum are neglected.



Doc #19: Page 25 of 58

## (20) Development and Validation of a Piloted Simulation of a Helicopter and External Sling Load

Pages: Cover Page, 6, 37, 48

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19790005912.pdf>

## Government Admits Flat Earth: Doc #20



NASA Technical Paper 1285

Title: The Development and Validation of a Piloted Simulation of a Helicopter and External Sling Load

Author: J. D. Shaughnessy,  
Thomas N. Deaux, and  
Kenneth R. Yenni

URL:  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19790005912.pdf>

Development and Validation  
of a Piloted Simulation  
of a Helicopter and  
External Sling Load

CASE FILE  
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A general set of nonlinear, rigid-body equations of motion for both the helicopter and external load determines the motion of each vehicle with respect to a flat, nonrotating Earth. An algorithm determines the trimmed helicopter control positions, helicopter attitude, and load position and attitude so that the entire dynamic system is in unaccelerated flight for a specified initial flight condition. Another algorithm obtains the equivalent linear system from the nonlinear model once the helicopter is trimmed; the linear system is used for verification and validation only.



Doc #21: Page 6 of 115



#### Equations of Motion

The equations of motion for both the helicopter and the external sling load are developed in body axes with respect to a flat, nonrotating Earth. It is assumed for convenience that each body is rigid and that the  $x_h-z_h$  plane and the  $x_l-z_l$  plane are planes of mass symmetry and that gyroscopic effects of engines are negligible. The equations of motion for the helicopter are developed first.



Doc #21: Page 37 of 115



The 7.3-m by 18.3-m terrain model board of the VLDS includes two airports and surrounding terrain, one at 750/1 scale and the other at 1500/1 scale, and is shown in figure 22. There are a total of five paved runways, from 0.6 km to 3.5 km in length. A helipad is located on the 750/1 airport and is shown in figure 23. It consists of a Maltese cross with a 45-m by 45-m border. The terrain is generally flat, and provision is made for variable visibility, variable cloud-base heights, and day, dusk, and night scenes.

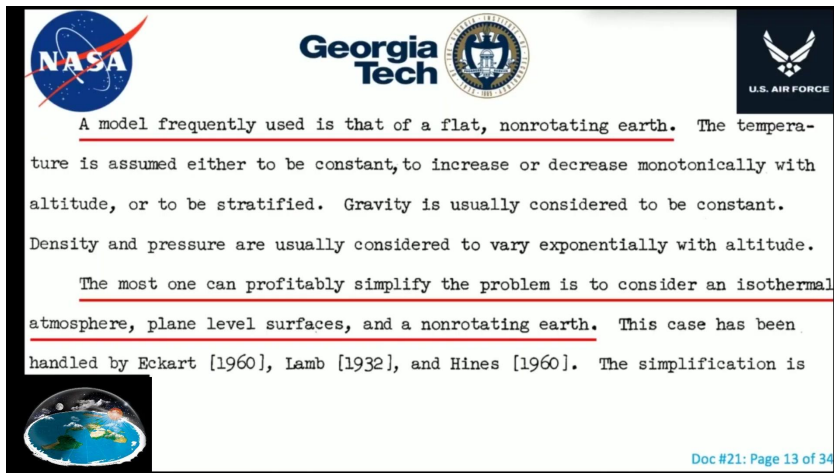
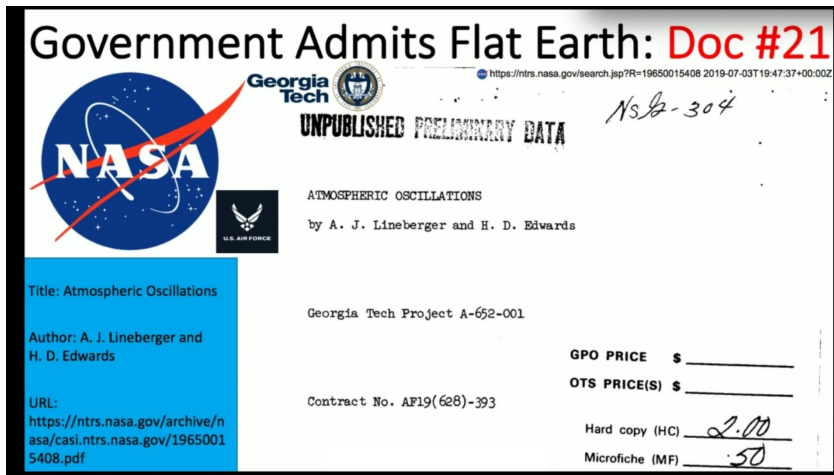


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## (21) Atmospheric Oscillations

Page: Cover Page, 13

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19650015408.pdf>



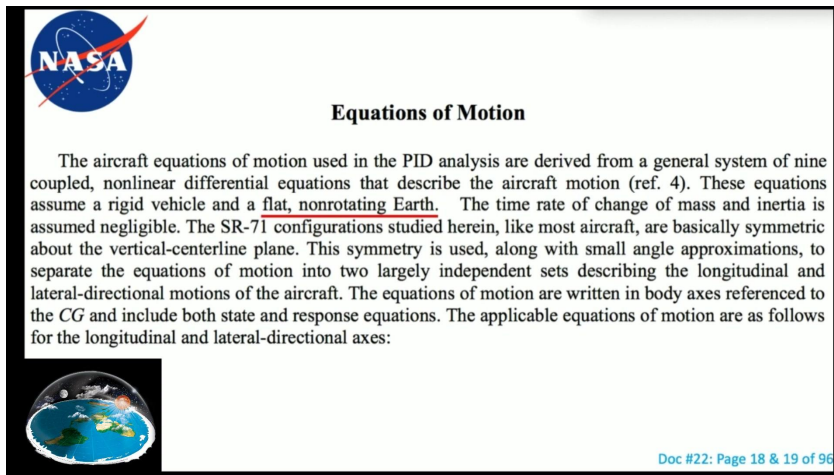
## (22) Stability and Control Estimation Flight Test Results for the SR-71 Aircraft With Externally Mounted Experiments

Page: Cover Page, 18, 19

[https://www.nasa.gov/centers/dryden/pdf/88733main\\_H-2465.pdf](https://www.nasa.gov/centers/dryden/pdf/88733main_H-2465.pdf)



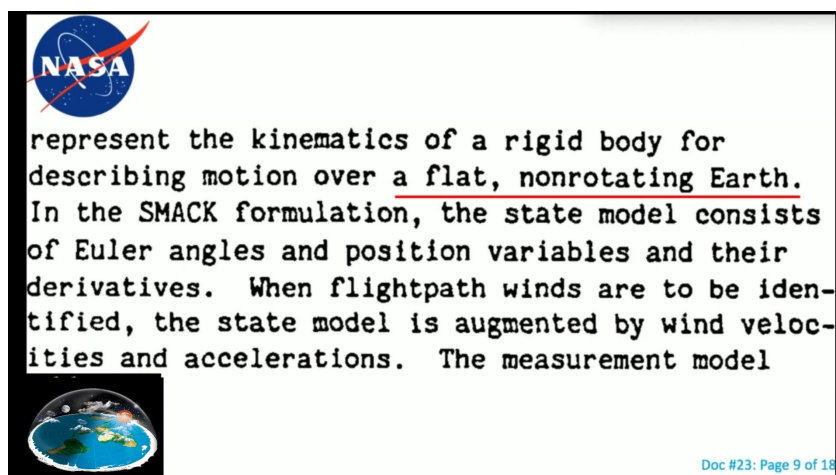
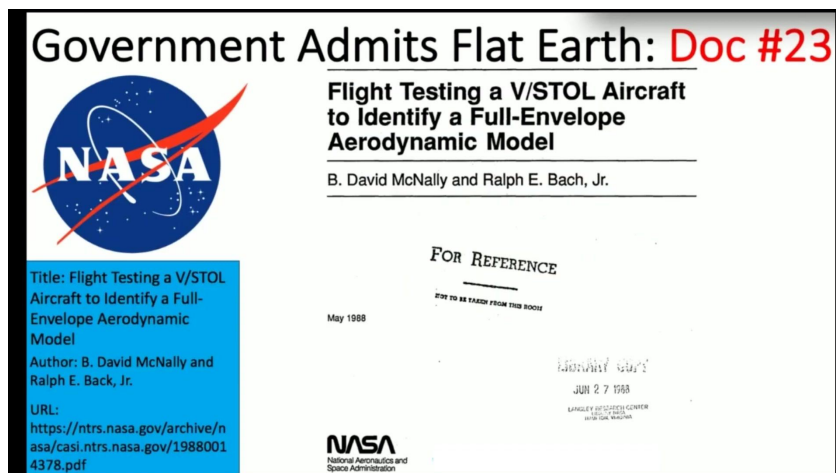




### (23) Flight Testing a V/STOL Aircraft to Identify a Full-Envelope Aerodynamic Model

Page: Cover Page, 9

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19880014378.pdf>



### (24) Singular Arc Time-Optimal Climb Trajectory of Aircraft in a Two-Dimensional Wind Field

Page: Cover Page, 2

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20060053337.pdf>

## Government Admits Flat Earth: Doc #24



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### Singular Arc Time-Optimal Climb Trajectory of Aircraft in a Two-Dimensional Wind Field

Nhan Nguyen\*

NASA Ames Research Center, Moffett Field, CA 94035

Title: Singular Arc Time-Optimal Climb Trajectory of Aircraft in a Two-Dimensional Wind Field

Author: Nhan Nguyen

URL:

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20060053337.pdf>

This paper presents a study of a minimum time-to-climb trajectory analysis for aircraft flying in a two-dimensional altitude dependent wind field. The time optimal control problem possesses a singular control structure when the lift coefficient is taken as a control variable. A singular arc analysis is performed to obtain an optimal control solution on the singular arc. Using a time-scale separation with the flight path angle treated as a fast state, the dimensionality of the optimal control solution is reduced by eliminating the lift coefficient control. A further singular arc analysis is used to decompose the original optimal control solution into the flight path angle solution and a trajectory solution as a function of the airspeed and altitude. The optimal control solutions for the initial and final climb segments are computed using a shooting method with known starting values on the singular arc. The numerical results of the shooting method show that the optimal flight path angle on the initial and final climb segments are constant. The analytical approach provides a rapid means for analyzing a time optimal trajectory for aircraft performance.



### II. Singular Arc Optimal Control

In our minimum time-to-climb problem, the aircraft is modeled as a point mass and the flight trajectory is strictly confined in a vertical plane on a non-rotating, flat earth. The change in mass of the aircraft is neglected and the engine thrust vector is assumed to point in the direction of the aircraft velocity vector. In addition, the aircraft is assumed to fly in an atmospheric wind field comprising of both horizontal and vertical components that are altitude-dependent. The horizontal wind component normally comprises a longitudinal and lateral component. We assume that the aircraft motion is symmetric so that the lateral wind component is not included. Thus, the pertinent equations of motion for the problem are defined in its the state variable form as



Doc #24: Page 2 of 16

## (25) Studies On Instabilities in Long-Baseline Two-Way Satellite Time and Frequency Transfer (TWSTFT) Including a Troposphere Delay Model

Pages: Cover Page, 2, 6

<https://tycho.usno.navy.mil/ptti/2007papers/paper21.pdf>

## Government Admits Flat Earth: Doc #25



39<sup>th</sup> Annual Precise Time and Time Interval (PTTI) Meeting

### STUDIES ON INSTABILITIES IN LONG-BASELINE TWO-WAY SATELLITE TIME AND FREQUENCY TRANSFER (TWSTFT) INCLUDING A TROPOSPHERE DELAY MODEL

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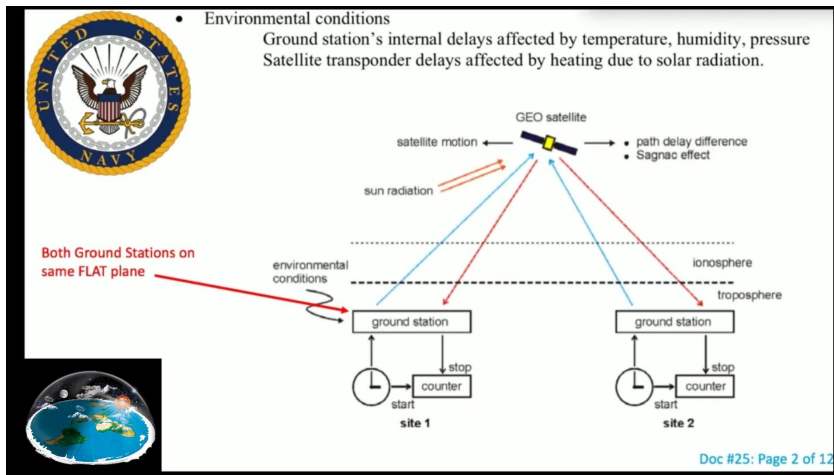
Korea Research Institute of Standards and Science (KRISS)  
Daejeon, Korea

Title: STUDIES ON INSTABILITIES IN LONG-BASELINE TWO-WAY SATELLITE TIME AND FREQUENCY TRANSFER (TWSTFT) INCLUDING A TROPOSPHERE DELAY MODEL

Author: D. Piester, A. Bauch

URL:

<https://tycho.usno.navy.mil/ptti/2007papers/paper21.pdf>



39<sup>th</sup> Annual Precise Time and Time Interval (PTTI) Meeting

mapping functions. Two are rough approaches, namely a simple plane troposphere (assuming a flat Earth) and the straight "line of sight" through the spherical troposphere shell [14]. While these two functions result in too large or too small values, respectively, we use for the path length computation the mapping function as reported by Niell (equation 4 in [15]). The results for all three mapping functions for different elevation angles at a fixed troposphere height (11 km) is shown in Fig. 6 (right).

Doc #25: Page 6 of 12

## (26) Scale-Insensitive Detection Algorithm for FLIR Imagery

Page: Cover Page, 6

<https://www.arl.army.mil/arlreports/2001/ARL-TN-175.pdf>

# Government Admits Flat Earth: Doc #26

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## Scale-Insensitive Detection Algorithm for FLIR Imagery

Title: Scale-Insensitive Detection Algorithm for FLIR Imagery

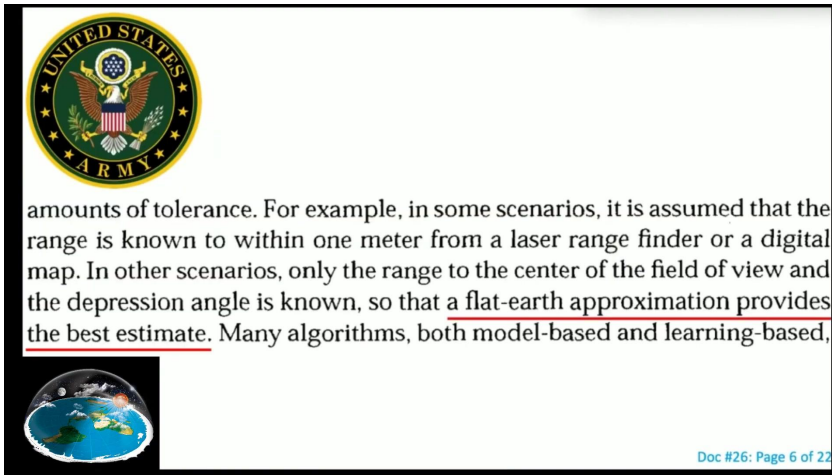
Author: Sandor Der, Chris Dwan, Alex Chan, Heesung Kwon, and Nasser Nasrabadi

Sandor Der, Chris Dwan, Alex Chan, Heesung Kwon, and Nasser Nasrabadi

URL: <https://www.arl.army.mil/arlreports/2001/ARL-TN-175.pdf>

ARL-TN-175

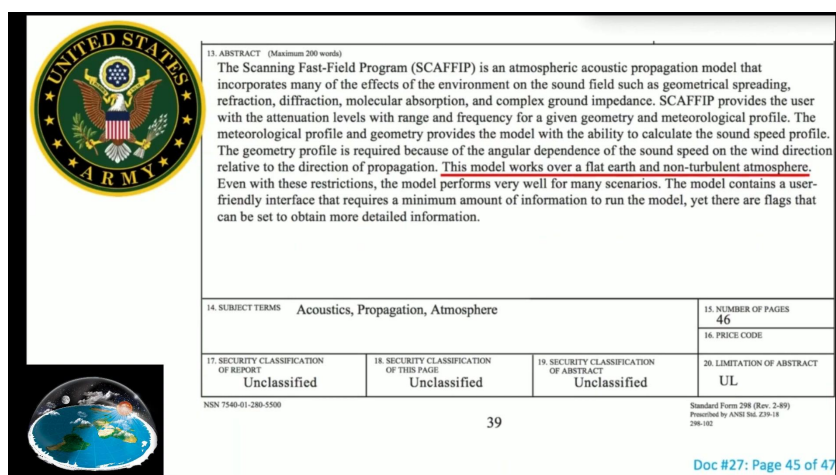
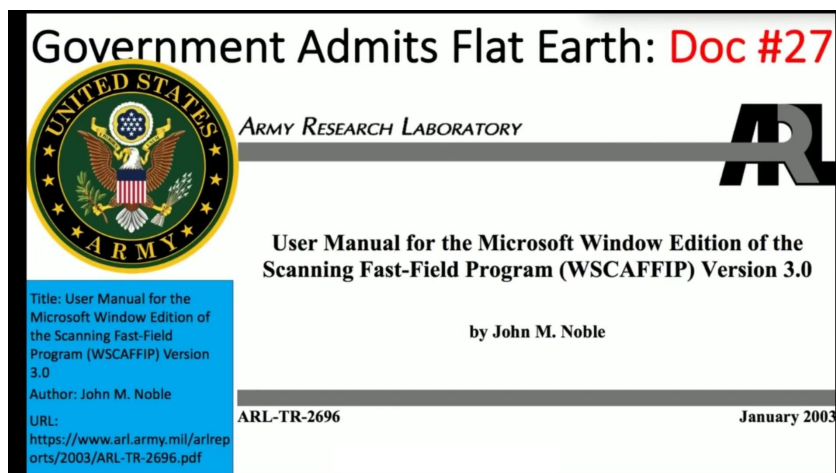
February 2001



## (27) User Manual for the Microsoft Window Edition of the Scanning Fast-Field Program (WSCAFFIP) Version 3.0

Page: Cover Page, 45

<https://www.arl.army.mil/arlreports/2003/ARL-TR-2696.pdf>



## (28) Path-Loss Measurements in a Forested Environment at VHF

Pages: Cover Page, 8, 16, 17, 18, 19, 20, 23, 25, 26, 35

<http://www.arl.army.mil/arlreports/2000/ARL-TR-2156.pdf>



# Government Admits Flat Earth: Doc #28



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## Path-Loss Measurements in a Forested Environment at VHF

Title: Path-Loss Measurements in a Forested Environment at VHF

Author: Robert J. Tan and Suzanne R. Stratton

URL: <http://www.arl.army.mil/arreports/2000/ARL-TR-2156.pdf>

Robert J. Tan and Suzanne R. Stratton

ARL-TR-2156

September 2000



### Multipath Measurements

We made multipath measurements to provide confidence in the data and to get an idea of how well our measurements of the clearing represented an ideal flat earth. We measured the path loss at a range of 410 m with the



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## Multipath Data

In this section, we discuss the data for the measurements described in section 2.2. Figure 9 plots the transmission loss as a function of transmit antenna height for 145, 223, 300, 435, and 910 MHz, respectively. The receive antenna height was 2.7 m and the range was 410 m for all frequencies except 435 MHz, where the receive height was 3.6 m and the range was 200 m. The expected transmission loss in decibels over a flat earth is given by

$$\frac{P_R}{P_T} = 10 \log \left[ 2 \sin \left( \frac{2\pi h_t h_r}{\lambda R} \right) \right]^2 \left[ \frac{\lambda}{4\pi R} \right]^2, \quad (2)$$



Figure 9. Comparison of measurements to theory for transmission loss over flat earth for a range of 410 m and a receive antenna height of 2.7 m for (a) 145, (b) 223, and (c) 300 MHz.

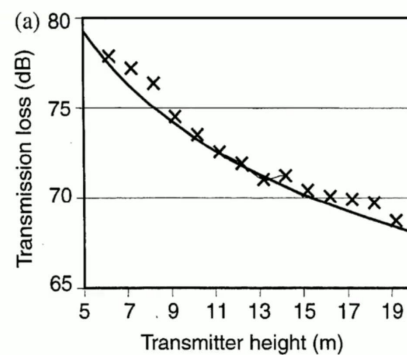
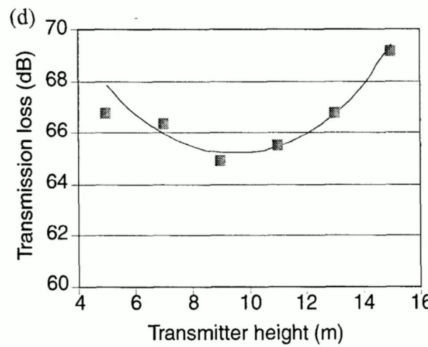




Figure 9 (cont'd). Comparison of measurements to theory for transmission loss over flat earth for a range of 410 m and a receive antenna height of 2.7 m for (d) 435 and (e) 910 MHz.



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and with loss over the earth, in decibels, given by equation (2) (theory). Equation (2) assumes a flat, lossless, and perfectly reflecting ground. The measured data in figure 11 are for a transmit height of 22 m, a receive height of 5 m, and for HH polarization. Agreement within about 5 dB is obtained between theory and measurements. The difference between the theory for propagation over flat earth given by equation (2) and the measurements is because the measurements were made on an irregular lossy ground with obstacles on both sides.

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the local trees and brush can cause such variations. After the data were inspected, it became apparent that they tended to agree with the theory given by equation (2), plus some fixed attenuation, and therefore allowed us to develop an analytical expression based on flat earth theory. This fixed attenuation is independent of range but varies with frequency.

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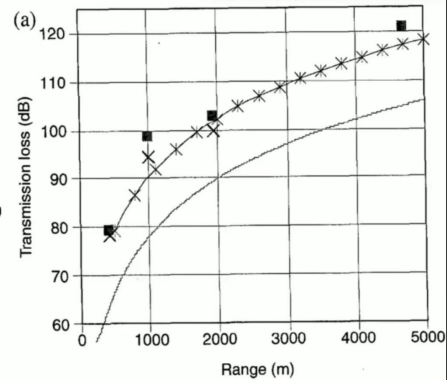
the results generated by the model are shown as curves. Figure 15 plots propagation loss data in decibels for selected antenna heights as a function of range (transmit height of 22 m and receive height of 2.7 m). The data in figure 15 compare loss over flat earth (theory) given by equation (2) in section 4.1 and the analytical model given in equation (4). The



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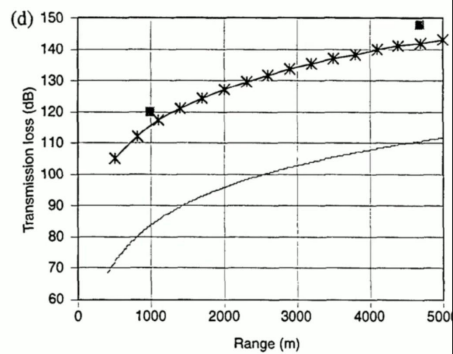
Figure 15. Comparison of measured propagation loss, loss over flat earth, and an analytical model for HH polarization in decibels plotted as a function of range for (a) 145, (b) 223, (c) 300 MHz.



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Figure 15 (cont'd). Comparison of measured propagation loss, loss over flat earth, and an analytical model for HH polarization in decibels plotted as a function of range for (d) 435 and (e) 910 MHz.



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## Conclusions


The measurements we made in the clearing area agreed with theory to within about 5 dB, and the deviations are largely because the clearing was not perfectly flat nor without obstacles. Because HH polarization clearly gave the best penetration through woods, all the following conclusions are based on HH polarization only. The propagation loss through woods tends to agree with the theory plus a fixed attenuation; therefore, we developed an analytical expression by adding an attenuation to the theory of loss over flat earth. The resultant expression for determining the propagation loss in decibels is given by

$$L_p = -10 \log \left[ \left( \frac{4\pi h_t h_r}{\lambda R} \right)^2 \left( \frac{\lambda}{4\pi R} \right)^2 \right] + 10 \log (f^{5.4}) - 108, \quad (4)$$

where

- $h_r$  = receive antenna height,
- $h_t$  = transmit antenna height,
- $R$  = range,
- $\lambda$  = wavelength, and
- $f$  = frequency in megahertz.



The first part of the above expression is the predicted path loss over flat earth [6]; the second part is the fixed attenuation caused by woods at a given frequency. This equation models the propagation loss through the


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## (29) Review of Sound Propagation in the Lower Atmosphere

Page: Cover Page, 18, 208

<https://apps.dtic.mil/dtic/tr/fulltext/u2/067880.pdf>

# Government Admits Flat Earth: Doc #29

**REVIEW OF SOUND PROPAGATION  
IN THE LOWER ATMOSPHERE**

Wesley L. Nyborg  
David Minizer  
Brown University

May 1955



Aero Medical Laboratory  
Contract No. AF 33(616)-340  
Project No. 7212

Wright Air Development Center  
Air Research and Development Command  
United States Air Force  
Wright-Patterson Air Force Base, Ohio


**Title:** Review of Sound Propagation in the Lower Atmosphere


**Author:** Wesley L. Nyborg, David Minizer

**URL:**  
<https://apps.dtic.mil/dtic/tr/fulltext/u2/067880.pdf>





In most of the topics to be discussed the problem is to describe the sound field in a region of atmosphere above a flat earth. More specifically, the chosen aim is to state the sound pressure  $p$  at any point  $P$  due to a source, whose pertinent properties are assumed known, localized near another point  $Q$ . Unless otherwise stated, it will be


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U.S. AIR FORCE



BROWN UNIVERSITY

21. H. Bremmer, The Extension of Sommerfeld's Formula for the Propagation of Radio Waves over a Flat Earth to Different Conductivities of the Soil, *Physica XX*, 441, (1954)




Doc #29: Page 208 of 234


### (30) Beacon Position and Attitude Navigation Aided by a Magnetometer

Page: Cover Page, 11

<https://www.arl.army.mil/arlreports/2010/ARL-CR-650.pdf>



ARMY RESEARCH LABORATORY



## Government Admits Flat Earth: Doc #30

### Beacon Position and Attitude Navigation Aided by a Magnetometer

by Xu Ma and Gonzalo R. Arce


Title: Beacon Position and Attitude Navigation Aided by a Magnetometer

Author: Xu Ma and Gonzalo R. Arce

URL: <https://www.arl.army.mil/arlreports/2010/ARL-CR-650.pdf>

ARL-CR-650

June 2010



#### 2.1 Coordinate Systems

The motion of an object is usually described by rigid body equations of motion derived from Newton's laws (29). This section summarizes and notates three kinds of coordinate systems. The first is the Earth-fixed coordinate system, which is fixed to the Earth with a flat Earth assumption. Denote  $X$ ,  $Y$ , and  $Z$  as the unit vectors pointing in the directions of the  $X$ ,  $Y$ , and  $Z$  axes, respectively. Without loss of generality, the  $X$ ,  $Y$ , and  $Z$  axes point to forward, right, and down, respectively. The second is the body-fixed coordinate system, with three unit vectors  $X_b$ ,

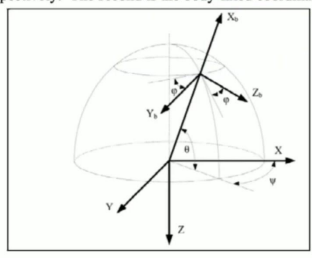



Figure 1. Earth- and body-fixed coordinate systems and the Euler angle rotations.



Doc #30: Page 11 of 38

### (31) Automatic Target Acquisition of the DEMO III Program

Page: Cover Page, 9

<http://www.arl.army.mil/arlreports/2002/ARL-TR-2683.pdf>

## Government Admits Flat Earth: Doc #31



ARMY RESEARCH LABORATORY



### Automatic Target Acquisition of the DEMO III Program

by Sandor Der, Alex Chan, Gary Stolovy, Michael Lander,  
and Matthew Thielke

Title: Automatic Target  
Acquisition of the DEMO III  
Program

Author: Sandor Der, Alex  
Chan, Gary Stolovy, Michael  
Lander, and Matthew Thielke

URL:  
<http://www.arl.army.mil/arlreports/2002/ARL-TR-2683.pdf>

ARL-TR-2683

August 200



of tolerance. For example, in some scenarios, it is assumed that the range is known to within a meter from a laser range finder or a digital map. In other scenarios, only the range to the center of the field-of-view and the depression angle is known so that a flat earth approximation provides the best estimate. Many algorithms, both model-based and learning-based, either require accurate range information or compensate for inaccurate information by attempting to detect targets at a number of different ranges within the tolerance of the range. Because many



Doc #31: Page 9 of 38

## (32) Modeling of Atmospheric Effects

Page: Cover Page, 28

<https://www.arl.army.mil/arlreports/2000/ARL-TR-1812.pdf>

## Government Admits Flat Earth: Doc #32



Army Research Laboratory



### Modeling of Atmospheric Effects


Title: Modeling of  
Atmospheric Effects

Author: Richard Shirkey


URL:  
<https://www.arl.army.mil/arlreports/2000/ARL-TR-1812.pdf>

by  
Richard Shirkey

Computational & Information Sciences Directorate  
Battlefield Environment Division



Acoustic Sensor Integration System (BASIS) and the BASE. BASE will be a versatile Unix-based acoustic decision aid the first version of which is under development and will be available by the end of FY00. The geometry profile is required because of the angular dependence of the sound speed; that is, the wind direction is related to the direction of propagation. This model works well over a flat-earth and a non-turbulent atmosphere. In the near future this model will be added to the EOSAEL.



Doc #32: Page 28 of 51

### (33) Telemetry Standards

Page: Cover Page, 172

[http://www.irig106.org/docs/106-17/106-17\\_Telemetry\\_Standards.pdf](http://www.irig106.org/docs/106-17/106-17_Telemetry_Standards.pdf)

## Government Admits Flat Earth: Doc #33

IRIG STANDARD 106-17




TELEMETRY STANDARDS

ABERDEEN TEST CENTER  
DUGWAY PROVING GROUND  
REAGAN TEST SITE  
REDSTONE TEST CENTER  
WHITE SANDS MISSILE RANGE  
YUMA PROVING GROUND


NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION  
NAVAL AIR WARFARE CENTER WEAPONS DIVISION  
NAVAL UNDERSEA WARFARE CENTER DIVISION, KEYPORT  
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT  
PACIFIC MISSILE RANGE FACILITY

30TH SPACE WING  
45TH SPACE WING  
96TH TEST WING  
412TH TEST WING  
ARNOLD ENGINEERING DEVELOPMENT COMPLEX

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION


**Title: Telemetry Standards**

URL:  
[http://www.irig106.org/docs/106-17/106-17\\_Telemetry\\_Standards.pdf](http://www.irig106.org/docs/106-17/106-17_Telemetry_Standards.pdf)



Telemetry Standards, RCC Standard 106-17 Chapter 2, July 2017

Although the equations for the two-ray model can be rather daunting, in its simplest form one uses flat-earth trigonometry to compute the difference in path lengths between the direct and reflected signals. This depends on the horizontal distance  $d$ , the altitude of the aircraft  $h_t$ , and the height above ground of the AMT receive antenna,  $h_r$ . Using trigonometry and assuming that the signal is reflected from the ground and/or sea with a reflection coefficient of magnitude 1, the aircraft altitudes and locations can be computed for which positive and negative signal reinforcement due to multipath occur. When the direct path and the reflected path differ by an even number of signal half-wavelengths  $\lambda/2$ , signal reinforcement occurs. When they differ by an odd number of half-wavelengths, deep fades occur.



Doc #33: Page 172 of 1168

### (34) Approximate Optimal Guidance for the Advanced Launch System

Page: Cover Page, 32, 43

<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19940020279.pdf>



# Government Admits Flat Earth: Doc #34

<https://ntrs.nasa.gov/search.jsp?R=19940020279> 2019-07-04T03:35:58-00:00Z



NASA Contractor Report 4568

## Approximate Optimal Guidance for the Advanced Launch System

T. S. Feeley and J. L. Speyer  
The University of California at Los Angeles  
Los Angeles, California

Title: Approximate Optimal  
Guidance for the Advanced  
Launch System

Authors: T.S. Feeley and J.L.  
Speyer

URL:  
<https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/19940020279.pdf>

Prepared for  
Langley Research Center  
under Grant NAG1-1080

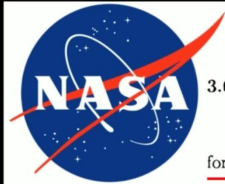
**NASA**  
National Aeronautics and  
Space Administration  
Office of Management  
Scientific and Technical  
Information Program  
1993



sion, aerodynamics, masses, gravity, and the atmosphere. A small expansion parameter, the ratio of the atmospheric scale height to the radius of the Earth is then used to separate the dynamics into the primary and perturbation effects. Lastly, the equations of motion for the zeroth-order problem of flight in a vacuum over a flat Earth are presented.

The Advanced Launch System (ALS) is designed to be an all-weather unmanned, two-stage launch vehicle for placing medium payloads into a low Earth orbit. The spacecraft (fig. 3.1) consists of a liquid rocket booster with

Doc #34: Page 32 of 164



### 3.6.1 Two-Dimensional Flight

In this section the three-dimensional equations of motion are reduced for flight in a great-circle plane (the X-Z plane) over a flat, nonrotating Earth. If the vehicle is assumed to be restricted to fly in the equatorial plane then the lift, thrust, and velocity vectors all lie in the same plane and the roll angle ( $\mu = 0$ ) is eliminated from the equations. Under the previously mentioned assumptions of no side force ( $Q = 0$ ) and no sideslip ( $\beta = 0$ ), the zeroth-order equations of motion representing flight in a vacuum over a flat Earth become

$$\dot{h} = V \sin \gamma \quad (3.24)$$

Doc #34: Page 43 of 164

## (35) Flight Simulation Software at NASA Dryden Flight Research Center

Pages: Cover Page, 4, 10

[https://www.nasa.gov/centers/dryden/pdf/88380main\\_H-2052.pdf](https://www.nasa.gov/centers/dryden/pdf/88380main_H-2052.pdf)

## Government Admits Flat Earth: Doc #35



NASA Technical Memorandum 104315

### Flight Simulation Software at NASA Dryden Flight Research Center

Ken A. Norlin

October 1995

Title: Flight Simulation  
Software at NASA Dryden  
Flight Research Center

Authors: Ken A. Norlin

URL:  
[https://www.nasa.gov/centers/dryden/pdf/88380main\\_H-2052.pdf](https://www.nasa.gov/centers/dryden/pdf/88380main_H-2052.pdf)



National Aeronautics and  
Space Administration



structure. This structure, with both flat- and oblate-Earth versions, has successfully supported more than 50 different aircraft. The software is used in batch-mode, real-time pilot-in-the-loop, and flight hardware-in-the-loop operation.



Doc #35: Page 4 of 21



In most cases, flat-Earth six-degree-of-freedom equations of motion are used. Oblate-Earth equations of motion were developed for the space shuttle simulation and later used in the NASP and follow-on simulation studies. The flat- and oblate-Earth equations of motion



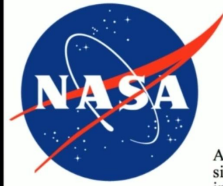
Doc #35: Page 10 of 21

### (36) Simulator Aero Model Implementation

Page: Cover Page, 10

<https://www.aviationsystemsdivision.arc.nasa.gov/publications/hitl/rtsim/Toms.pdf>

## Government Admits Flat Earth: Doc #36



### SIMULATOR AERO MODEL IMPLEMENTATION

Thomas S. Alderete<sup>1</sup>

#### SUMMARY

A general discussion of the type of mathematical model used in a real-time, flight simulation is presented. It is recommended that the approach to math model development include modularity and standardization as modification and maintenance of the model will be much more efficient with this approach. The general equations of motion for an aircraft are developed in a form best suited to real time simulation. Models for a few helicopter subsystems are discussed in terms of general approaches that are commonly taken in today's simulations.

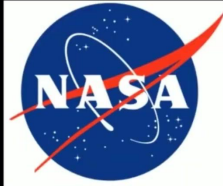
Title: Simulator Aero Model Implementation

Authors: Thomas S. Alderete

URL:  
<https://www.aviationssystemsdvion.arc.nasa.gov/publications/html/rtsim/Toms.pdf>

#### INTRODUCTION

This chapter is intended to provide the reader with a understanding of the type of mathematical model used in a real-time flight simulation. A flight simulation system is



**Transformation of Translational Equations to an Inertial Frame.** For the flat, non-rotating earth considered here, any fixed frame of reference can be employed as an inertial frame. The three forces acting on the aircraft center of gravity in the body axis system are rotated back through the Euler angles to the local frame and translated back to some convenient origin.



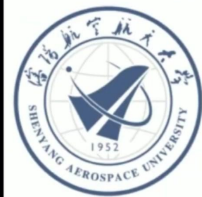
Doc #36: Page 10 of 21

## (37) Design and Implementation of Flight Visual Simulation System

Page: Cover Page, 3

<https://arxiv.org/pdf/1212.0365.pdf>

## Government Admits Flat Earth: Doc #37



### Design and Implementation of Flight Visual Simulation System

Feng Tian<sup>1</sup>, Wenjian Chai<sup>1</sup>, Chuanyun Wang<sup>1</sup>,

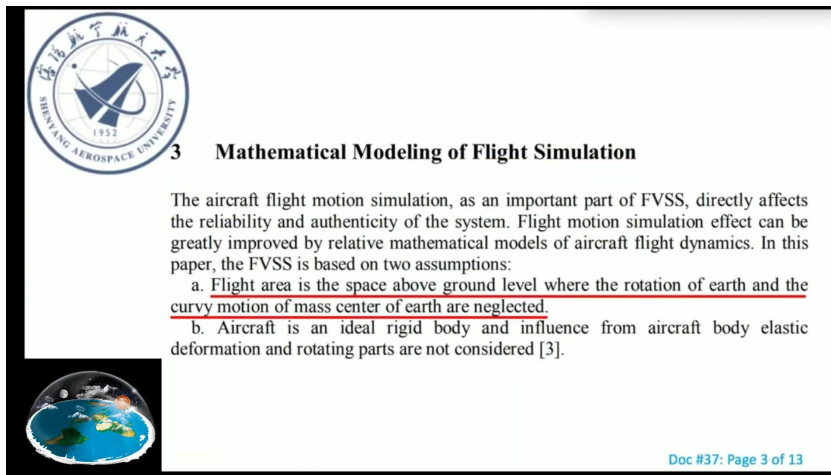
<sup>1</sup> School of Computer Science, Shenyang Aerospace University,  
110136 Shenyang, China  
{tianfeng5861, cimu.love, wangcy0301}@163.com

Title: Design and Implementation of Flight Visual Simulation System

Authors: Feng Tian, Wenjian Chai, Chuanyun Wang

URL:  
<https://arxiv.org/pdf/1212.0365.pdf>

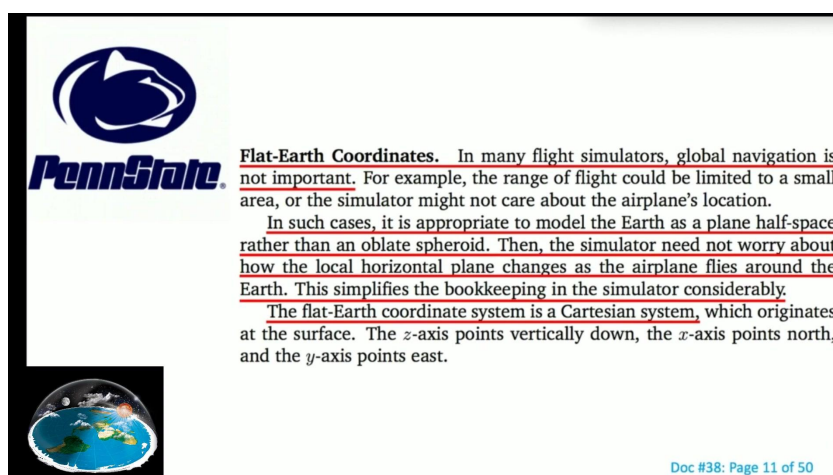
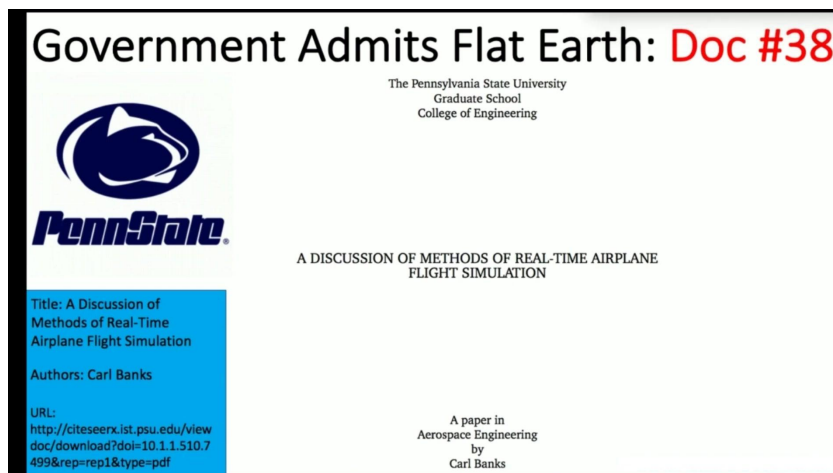
**Abstract.** The design requirement for flight visual simulation system is studied. and the overall structure and development process are proposed in this paper. Through the construction of 3D scene model library and aircraft model, the rendering and interaction of visual scene are implemented. The changes of aircraft flight attitude in visual system are controlled by real-time calculation of aircraft aerodynamic and dynamic equations and flight simulation effect is enhanced by this kind of control. Several key techniques for optimizing 3D model and relative methods for large terrain modeling are explored for improving loading ability and rendering speed of the system. Experiment shows that, with specific function and performance guaranteed as a premise, the system achieves expected results, that is, precise real-time calculation of flight attitude and smooth realistic screen effect.



### (38) A Discussion of Methods of Real-Time Airplane Flight Simulation

Page: Cover Page, 11

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.510.7499&rep=rep1&type=pdf>



### (39) The American Practical Navigator: An Epitome of Navigation

Pages: Cover Page, 351, 355, 573, 636

[http://geocenter.survey.ntua.gr/main/labs/carto/academic/persons/bnakos\\_site\\_nafp/docume ntation/american\\_practical\\_navigator.pdf](http://geocenter.survey.ntua.gr/main/labs/carto/academic/persons/bnakos_site_nafp/docume ntation/american_practical_navigator.pdf)



# Government Admits Flat Earth: Doc #39

Pub. No. 9



## THE AMERICAN PRACTICAL NAVIGATOR

AN EPITOME OF NAVIGATION

ORIGINALLY BY  
NATHANIEL BOWDITCH, LL.D.



1995 EDITION



Title: The American Practical Navigator: An Epitome of Navigation

Original Author: Nathaniel Bowditch, LL.D.

URL:  
[http://geocenter.survey.ntua.gr/main/labs/cartographic/persons/bnako/s\\_site\\_nafp/documentation/american\\_practical\\_navigator.pdf](http://geocenter.survey.ntua.gr/main/labs/cartographic/persons/bnako/s_site_nafp/documentation/american_practical_navigator.pdf)






Distance by vertical angle between the waterline and the top of an object is computed by solving the right triangle formed between the observer, the top of the object, and the waterline of the object by simple trigonometry. This assumes that the observer is at sea level, the earth is flat between observer and object, there is no refraction, and the object and its waterline form a right angle. For most cases of practical significance, these assumptions produce no ~~large~~ errors.


### Earth



Acceleration due to gravity (standard)	— — —	= 980.665 centimeters per second per second = 32.1740 feet per second per second
Mass-ratio—Sun/Earth	— — — — —	= 332,958
Mass-ratio—Sun/(Earth & Moon)	— — — — —	= 328,912
Mass-ratio—Earth/Moon	— — — — —	= 81.30
Mean density	— — — — —	= 5.517 grams per cubic centimeter
Velocity of escape	— — — — —	= 6.94 statute miles per second
Curvature of surface	— — — — —	= 0.8 foot per nautical mile


Doc #39: Page 355 of 714





**backshore**, *n.* That part of a beach which is usually dry, being reached only by the highest tides, and by extension, a narrow strip of relatively flat coast bordering the sea. See also FORESHORE.


Doc #39: Page 573 of 714

**line of sight**. The straight line between two points, which does not follow the curvature of the earth.


Doc #39: Page 636 of 714

Doc #39 on page 11 of 714 states, “The earth is an oblate spheroid (a sphere flattened at the poles).” This statement is in direct contradiction to at least 5 different statements within the document itself:

Page 351 of 714 states, “This assumes that the observer is at sea level, the earth is flat between observer and object, there is no refraction, and the object and its waterline form a

right angle. For most cases of practical significance, these assumption produce no large errors.”

- 1) Waterline, assumes the water has a FLAT line
  - 2) “Earth is Flat between observer and object”
- 

Page 355 of 714 states, “Curvature of surface \_\_\_\_\_ = 0.8 foot per nautical mile”

- 3) If the earth was “flattened at the poles” then this calculation of the curvature is blatantly inaccurate, as the curvature of the surface of the earth would vary.
- 

Page 574 of 714 states, “back shore, n. That part of a beach which is usually dry, being reached. Only by the highest tides, and by extension, a narrow strip of relatively flat coast boarding the sea. See also FORESHORE.”

- 4) How can the there exist a “flat coast” bordering the sea if the sea curves? It can’t.
- 

Page 636 of 714 states, “line of sight. The straight line between two points, which does not follow the curvature of the earth.”

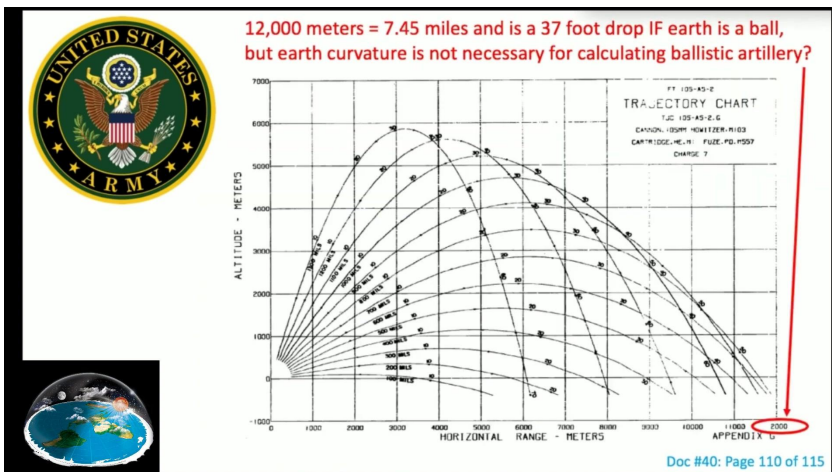
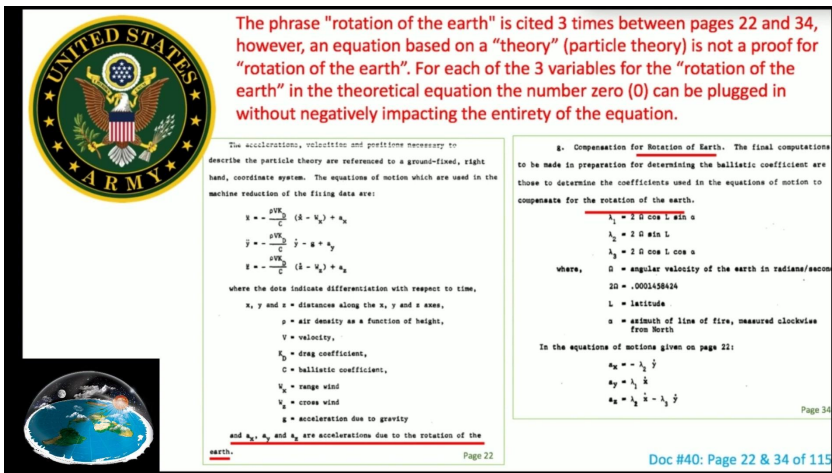
- 5) If the earth is a globe and curving in every direction downward from the observer, given the definition of “line of sight” it is impossible to achieve “line of sight” for every observation necessitates that it occurs over the “curvature of the earth”.

#### **(40) The Production of Firing Tables for Cannon Artillery**

Pages: Cover Page, 10, 22, 34, 110

<https://apps.dtic.mil/dtic/tr/fulltext/u2/826735.pdf>





Doc #40 on pages 66 – 68 of 115 references "Rotation of Earth":

- 1) Doc #40 does NOT account for curvature of earth
- 2) Doc #40 represents the "Rotation of Earth" in an equation for "particle theory", whereby, when the numerical value of zero (0) is plugged in for the variable to account for the alleged rotation it does not negatively impact the rest of the equation and it is able to compute.

#### (41) Field Artillery Manual Cannon Gunnery

Page: Cover Page, 175, 192

[https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/tc3\\_09x81.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/tc3_09x81.pdf)

# Government Admits Flat Earth: Doc #41

\* By Admission & Omission \*

TC 3-09.81



Title: Field Artillery Manual  
Cannon Gunnery

URL:  
[https://armypubs.army.mil/epubs/DR\\_pubs/DR\\_a/pdf/web/tc3\\_09x81.pdf](https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/tc3_09x81.pdf)

## Field Artillery Manual Cannon Gunnery

APRIL 2016

DISTRIBUTION RESTRICTION: Approved for public release; distribution is unlimited.  
\*This publication supersedes TC 3-09.81/MCWP 3-16.4, dated 1 March 2016.

Headquarters, Department of the Army



### STANDARD CONDITIONS

#### WEATHER

1	AIR TEMPERATURE 100 PERCENT
2	AIR DENSITY 100 PERCENT
3	NO WIND

#### POSITION

1	GUN, TARGET AND MDP AT SAME ALTITUDE
2	ACCURATE RANGE
3	NO ROTATION OF THE EARTH

#### MATERIAL

1	STANDARD WEAPON, PROJECTILE, AND FUZE
2	PROPELLANT TEMPERATURE (70° F)
3	LEVEL TRUNNIONS AND PRECISION SETTINGS
4	FIRING TABLE MUZZLE VELOCITY
5	NO DRIFT

Figure 7-1. Standard Conditions.

Doc #41: Page 175 of 664



### the-o-ry

noun

a supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained.

"Darwin's theory of evolution"

synonyms: hypothesis, thesis, conjecture, supposition, speculation, postulation, postulate, proposition, premise, surmise, assumption, presumption, presupposition, notion, guess, hunch, feeling, suspicion; More

7-22. Background theory of rotational effects may assist in understanding why table H is needed to determine a range correction for rotation of the earth.

- Because of rotation of the earth, a point on the equator has an eastward linear velocity of approximately 457 meters per second. The linear velocity decreases to 0 meters at either pole.
- Given a gun on the equator firing due east at a target (See figure 7-17.), during the time of flight of the projectile, the gun and the target will travel together from G to G' and T to T', respectively along the circumference of the earth. The projectile however will travel in a vertical plane, the base of which is parallel to the origin of the trajectory established at the time of firing. At the end of the given time of flight the projectile will be at P' when the target is at T'. Hence the projectile will continue along an extended trajectory and impact east of the target (over the target in this case). The effect is as if the quadrant elevation fired was in error by the amount of angle *a*. Angle *a* is the angle formed by the base line G'P' and a tangent to the earth at G'. With the gun firing eastward, angle *a* is positive (the projectile impacts over the target).



Doc #41: Page 192 of 664





I should have done a better analysis on doc #41. Sorry about that, and now here it is.

---

Doc #41, "Field Artillery Manual Cannon Gunnery", page 48 of 664:

"3-55. If a round were fired in a vacuum, gravity would cause the projectile to return to the surface of the earth. The path or trajectory of the projectile would be simple to trace. All projectiles, regardless of size, shape, or weight, would follow paths of the same parabolic shape and would achieve the same range for a given muzzle velocity and quadrant elevation."

Nathan Roberts's reply: The "parabolic shape" of the trajectory of the bullet is caused by density, not gravity or the alleged curvature of a spherically shaped earth.

---

Doc #41, "Field Artillery Manual Cannon Gunnery", page 48 of 664:

3-57. Gravity causes a projectile in flight to fall to the earth. Because of gravity, the height of the projectile at any instant is less than it would be if no such force were acting on it. In a vacuum, the vertical velocity would decrease from the initial velocity to zero on the ascending branch of the trajectory and increase from zero to the initial velocity on the descending branch. Zero vertical velocity would occur at the summit of the trajectory. For every vertical velocity value on the upward leg of the ascending branch there is an equal vertical velocity value downward on the descending branch. Since there would be no resistance to the forward motion of the projectile in a vacuum, the horizontal velocity component would be a constant. The acceleration caused by the force of gravity (9.81 m/s) affects only the vertical velocity."

Nathan Roberts's reply: Gravity is an unproven theory, buoyancy is proven. Bullets fall because they are heavier than the medium they are within, that being the air.

---

Doc #41, "Field Artillery Manual Cannon Gunnery", page 49 of 664:

“The standard (chart) range is the range opposite a given elevation in the firing tables. It is assumed to have been measured along the surface of a sphere concentric with the earth and passing through the muzzle of a weapon. For all practical purposes, standard range is the horizontal distance from the origin of the trajectory to the level point.”

Nathan Roberts’s reply: IF “It is assumed to have been measured along the surface of a sphere concentric with the earth”, then why in the very next sentence does it state “For all practical purposes, standard range is the horizontal distance from the origin of the trajectory to the level point.”

---

Doc #41, “Field Artillery Manual Cannon Gunnery”, page 51 of 664:

“Deflection effects. Some of the deviations from the standard conditions affecting deflection are:

- \* Drift.
- \* Crosswind.
- \* Rotation of the earth.”

Nathan Roberts’s reply: On page 192, “Rotation of the earth” is established as an “unproven theory”, which holds zero bearing in reality.

---

Doc #41, “Field Artillery Manual Cannon Gunnery”, page 132 of 664:

5-36. The third condition is valid met corrections considered by each of the firing platoons. This includes the met message valid for the firing platoon, propellant temperature, projectile weight, vertical interval, and corrections for earth rotation.

Nathan Roberts’s reply: On page 192, “Rotation of the earth” is established as an “unproven theory”, which holds zero bearing in reality.

---

Doc #41, “Field Artillery Manual Cannon Gunnery”, page 186 of 664:

“Range (Column 1). This is the distance measured from the muzzle to the target on the surface of a sphere concentric with the earth. When chart range is used as the entry argument for this table, it is expressed to the nearest 10 meters and interpolation is necessary.”

Nathan Roberts’s reply: The same response given to “sphere concentric with earth” mentioned on page 49 applies here too.

## **(42) Field Artillery Gunnery**


Pages: Cover Page, Azimuth

Only concept of Azimuth on a flat plane is discussed without reference to curvature or rotation of the globe earth or coriolis effect.

<http://militarynewbie.com/wp-content/uploads/2013/10/FM-3-09.8-FIELD-ARTILLERY-GUNNERY.pdf>

\* By Admission & Omission \*

## Government Admits Flat Earth: Doc #42




**Title:** Field Artillery Gunnery

**URL:** <http://militarynewbie.com/wp-content/uploads/2013/10/FM-3-09.8-FIELD-ARTILLERY-GUNNERY.pdf>

FM 3-09.8

**Field Artillery Gunnery**

JULY 2006  
HEADQUARTERS  
DEPARTMENT OF THE ARMY

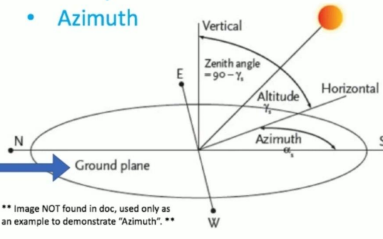


**Concepts NOT discussed in doc:**

- Coriolis
- Rotation of Earth
- Sphere
- Curvature
- Motion of Earth

**Concept discussed in doc:**

- Azimuth



**aka "FLAT", no curvature**

\*\* Image NOT found in doc, used only as an example to demonstrate "Azimuth". \*\*

Doc #42

### (43) TTP for the Field Artillery Cannon Gunnery


Pages: Cover Page, Azimuth

Only concept of Azimuth on a flat plane is discussed without reference to curvature or rotation of the globe earth or coriolis effect.

<https://www.globalsecurity.org/military/library/policy/usmc/mcwp/3-16-3/mcwp3-16-3.pdf>

\* By Admission & Omission \*

## Government Admits Flat Earth: Doc #43




**Title:** TTP for the Field Artillery Cannon Gunnery

**URL:** <https://www.globalsecurity.org/military/library/policy/usmc/mcwp/3-16-3/mcwp3-16-3.pdf>

MCWP 3-16.3  
FM 6-50

**TTP for the Field Artillery Cannon Gunnery**



U.S. Marine Corps





## How do we reconcile the difference and apparent contradiction of whether or NOT "rotation of the earth" needs to be taken into account?

- 1) Other than the mention of the terms "rotation of the earth" and "Coriolis", there is absolutely no instruction in the doc for "HOW TO" account for the rotation of the earth, why?
- 2) The rotation of the earth is a theory, and just as in the equation cited in the US Army doc Report 1371 and titled The Production of Firing Tables for Cannon Artillery allows for the variable of alleged rotation of the earth to be zero (0) leaving the entirety of the equation unaffected, and it is the same with this doc produced by the US Marine Corps.

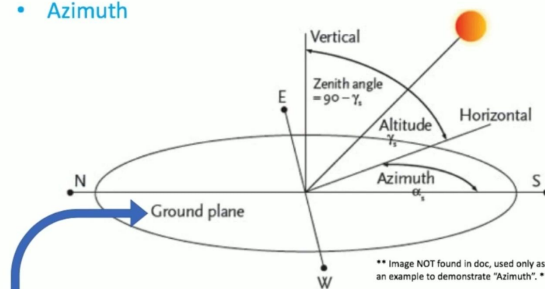


Doc #44



## Concept discussed in doc:

- Azimuth



\*\* Image NOT found in doc, used only as an example to demonstrate "Azimuth". \*\*

aka "FLAT", no curvature



Doc #44