REPORT NO. DOT–TSC–OST–73–21

TRANSPORTATION SYSTEMS CENTER BIBLIOGRAPHY OF TECHNICAL REPORTS

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October 1973

DEPARTMENT OF TRANSPORTATION
TRANSPORTATION SYSTEMS CENTER
Information Services Branch
Kendall Square, Cambridge MA 02142

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16. Abstract

This bibliography provides a complete listing of technical reports which have been published between July 1970 and June 1973 and released to the National Technical Information Service, Springfield VA 22151.

There are three main breakdowns by (1) title by COSATI subject fields; (2) DOT sponsoring agency, and (3) author. The author designation is cross-referenced to both subject and agency. Abstracts of each technical report present a brief overview of individual-report substantive information. The abstracts are also cross-referenced by COSATI field and subject title.

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PREFACE

The Department of Transportation, Transportation Systems Center, Information Services Branch publishes a semiannual bibliography in January and July of technical reports issued during the preceding six months. This twice-a-year document covers all reports released both internally and externally; supplements which are issued monthly note the availability of, or any limitation on, reports which have been published and distributed in the intervening months.

Beginning with the present bibliography which includes the technical reports from July 1, 1970, when this Center opened, through June 30, 1973, a yearly publication will update the reports emanating from the Center in the previous twelve months.

CONTENTS

Reports which have "Accession Numbers" listed
are also available from

DEPARTMENT OF COMMERCE
National Technical Information Service
Springfield, VA 22151

INTRODUCTION

TRANSPORTATION SYSTEMS CENTER REPORTS BIBLIOGRAPHY includes scientific and technical report literature. It is published by the Transportation Systems Center to simplify and improve access to Federal publications and data files.

This reports bibliography announces information released by technical directorates, divisions and branches within TSC. Announcements are arranged in 22 subject fields of the COSATI Subject Category list (AD-612-200). Reports covering more than one subject are announced in the primary field and cross-referenced in other fields. Reports are also indexed by author and by agency. The Author Index includes cross-references to the indexed Subject and Agency Indexes.

AVAILABILITY OF PUBLICATIONS

Publications referenced in this document are available from NTIS on subscription or standing order and can be obtained from NTIS in paper or microfiche copy, at the charges listed below.

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PRICING SCHEDULE
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National Technical Information Service
Springfield, VA 22151

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1 to 300 pages	$3.00
301 to 600 pages	6.00
601 to 900 pages	9.00
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Documents announced prior to January 1, 1969, have a service charge of $3.00 added to the announcement price.

MICROFICHE

Microfiche reproduction of documents on a demand basis is priced at $1.45 per document.

Documents available on Standing Order through NTIS Selective Dissemination of Microfiche Service (SDM) are priced at 35 cents per document.

TYPICAL JOURNAL ENTRIES

subject field → 1. AERONAUTICS

Includes the following Groups: Aerodynamics; Aeronautics, Aircraft; Aircraft Flight Control and Instrumentation; Air Facilities.

sponsoring agency name and address → FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

title → **CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM. THE BASIC, LEVEL 1 MODEL**
DOT–TSC–FAA–71–3
Transportation Systems Center ← performing organization name
Accession No. AD733752
author → de Hollan, A.N., Priver, A.S.
44 p.
April 1971
Conceptual Transportation Systems Model, Flight Simulation, Input Package, Output Package. ← key words

abstract → *A basic conceptual model of the entire Air Transportation System is being developed to serve as an analytical tool for studying the interactions among the System elements. The model is being designed to function in an interactive computer graphics environment which permits rapid alteration of rules and parameters, as well as continuous real-time graphical monitoring of system operations. The model described here is the first member in an evolving hierarchy of increasingly complex models, progressing in the direction of closer approximation to the real-world Air Transportation System.*

A FUNCTIONAL DESCRIPTION OF AIR TRAFFIC CONTROL
performing organization report no. → **DOT–TSC–FAA–71–4**
Transportation Systems Center
Accession No. AD-757089
Coonan, J.R., Mpontsikaris, P.
81 p. ← no. of pages
March 1971 ← date of report
ATC Event Sequence, ATC Functions.

This document contains a description of air traffic control in terms of generic operational functions. The functions are grouped by flight phase and by major system function (navigation, surveillance, control and communication). More detailed descriptions of these functions, and estimates of related parameters are contained in the appendix. A diagram is shown of the sequence of events for a typical IFR flight through the current ATC system. Also, certain aspects of ATC which cannot be described in terms of operational functions (e.g., legal responsibilities) are discussed.

SUBJECT FIELD STRUCTURE

FIELD 1. AERONAUTICS. Includes the following Groups: Aerodynamics; Aeronautics; Aircraft; Aircraft Flight Control and Instrumentation; Air Facilities.

FIELD 2. AGRICULTURE. Includes the following Groups: Agricultural Chemistry; Agricultural Economics; Agricultural Engineering, Agronomy and Horticulture; Animal Husbandry; Forestry.

FIELD 3. ASTRONOMY AND ASTROPHYSICS. Includes the following Groups: Astronomy; Astrophysics; Celestial Mechanics.

FIELD 4. ATMOSPHERIC SCIENCES. Includes the following Groups: Atmospheric Physics; Meteorology.

FIELD 5. BEHAVIORAL AND SOCIAL SCIENCES. Includes the following Groups: Administration and Management; Documentation and Information Technology; Economics; History, Law, and Political Science; Human Factors Engineering; Humanities; Linguistics; Man-machine Relations; Personnel Selection, Training, and Evaluation; Psychology (Individual and Group Behavior); Sociology.

FIELD 6. BIOLOGICAL AND MEDICAL SCIENCES. Includes the following Groups: Biochemistry; Bioengineering; Biology; Bionics; Clinical Medicine; Environmental Biology; Escape, Rescue, and Survival; Food, Hygiene and Sanitation; Industrial (Occupational) Medicine; Life Support; Medical and Hospital Equipment; Microbiology; Personnel Selection and Maintenance (Medical); Pharmacology; Physiology; Protective Equipment; Radiobiology; Stress Physiology; Toxicology; Weapon Effects.

FIELD 7. CHEMISTRY. Includes the following Groups: Chemical Engineering, Inorganic Chemistry; Organic Chemistry; Physical Chemistry, Radio and Radiation Chemistry.

FIELD 8. EARTH SCIENCES AND OCEANOGRAPHY. Includes the following Groups: Biological Oceanography; Cartography; Dynamic Oceanography; Geochemistry; Geodesy; Geography; Geology and Mineralogy; Hydrology and Limnology; Mining Engineering; Physical Oceanography; Seismology; Snow, Ice, and Permafrost; Soil Mechanics; Terrestrial Magnetism.

FIELD 9. ELECTRONICS AND ELECTRICAL ENGINEERING. Includes the following Groups: Components; Computers; Electronic and Electrical Engineering; Information Theory; Subsystems; and Telemetry.

FIELD 10. ENERGY CONVERSION (Non-propulsive). Includes the following Groups: Conversion Techniques; Power Sources; Energy Storage.

FIELD 11. MATERIALS. Includes the following groups: Adhesives and Seals; Ceramics, Refractories, and Glasses; Coatings, Colorants, and Finishes; Composite Materials; Fibers and Textiles; Metallurgy and Metallography; Miscellaneous Materials; Oils, Lubricants, and Hydraulic Fluids; Plastics; Rubbers; Solvents, Cleaners, and Abrasives; Wood and Paper Products.

FIELD 12. MATHEMATICAL SCIENCES. Includes the following Groups: Mathematics and Statistics; Operations Research.

FIELD 13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING. Includes the following Groups: Air Conditioning, Heating, Lighting, and Ventilating; Civil Engineering; Construction Equipment, Materials and Supplies; Containers and Packaging; Couplings, Fittings, Fasteners, and Joints; Ground Transportation Equipment; Hydraulic and Pneumatic Equipment; Industrial Processes; Machinery and Tools; Marine Engineering; Pumps, Filters, Pipes, Fittings, Tubing, and Valves; Safety Engineering; Structural Engineering.

FIELD 14. METHODS AND EQUIPMENT. Includes the following Groups: Cost Effectiveness; Laboratories, Test Facilities, and Test Equipment; Recording Devices; Reliability; Reprography.

FIELD 15. MILITARY SCIENCES. Includes the following Groups: Antisubmarine Warfare; Chemical, Biological, and Radiological Warfare; Defense; Intelligence; Logistics; Nuclear Warfare; Operations, Strategy, and Tactics.

FIELD 16. MISSILE TECHNOLOGY. Includes the following Groups: Missile Launching and Ground Support; Missile Trajectories; Missile Warheads and Fuses; Missiles.

FIELD 17. NAVIGATION, COMMUNICATIONS, DETECTION, AND COUNTERMEASURES. Includes the following Groups: Acoustic Detection; Communications; Direction Finding; Electromagnetic and Acoustic Countermeasures; Infrared and Ultraviolet Detection; Magnetic Detection; Navigation and Guidance; Optical Detection; Radar Detection; Seismic Detection.

SUBJECT FIELD STRUCTURE (CONT)

FIELD 18. NUCLEAR SCIENCE AND TECHNOLOGY. Includes the following Groups: Fusion Devices (Thermonuclear); Isotopes; Nuclear Explosions; Nuclear Instrumentation; Nuclear Power Plants; Radiation Shielding and Protection; Radioactive Wastes and Fission Products; Radioactivity; Reactor Engineering and Operation; Reactor Materials; Reactor Physics; Reactors (Power); Reactors (Non-power); SNAP Technology.

FIELD 19. ORDNANCE. Includes the following groups: Ammunition, Explosives, and Pyrotechnics; Bombs; Combat Vehicles, Explosions, Ballistics, and Armor; Fire Control and Bombing Systems; Guns; Rockets; Underwater Ordnance.

FIELD 20. PHYSICS. Includes the following Groups: Acoustics, Crystallography; Electricity and Magnetism; Fluid Mechanics; Masers and Lasers; Optics; Particle Accelerators; Particle Physics; Plasma Physics; Quantum Theory, Solid Mechanics, Solid-state Physics; Thermodynamics; Wave Propagation.

FIELD 21. PROPULSION AND FUELS. Includes the following Groups: Air-breathing Engines; Combustion and Ignition; Electric Propulsion; Fuels; Jet and Gas Turbine Engines; Nuclear Propulsion; Reciprocating Engines; Rocket Motors and Engines; Rocket Propellants.

FIELD 22. SPACE TECHNOLOGY. Includes the following Groups: Astronautics; Spacecraft; Spacecraft Trajectories and Reentry; Spacecraft Launch Vehicles and Ground Support.

SPONSORING AGENCIES

United States Coast Guard	USCG
Federal Aviation Adminstration	FAA
Federal Highway Administration	FHWA
Federal Railroad Administration	FRA
National Aeronautics and Space Administration	NASA
National Highway Traffic Safety Administration	NHTSA
Office of the Secretary	OST
St. Lawrence Seaway	SLS
Transportation Contractor	TSC
Urban Mass Transportation Administration	UMTA

TRANSPORTATION SYSTEMS CENTER SCIENTIFIC - TECHNICAL PUBLICATIONS

TECHNICAL REPORTS: Scientific and technical information considered important, complete, and a lasting contribution to an existing knowledge.

OPERATIONAL HANDBOOKS: Information providing operation and maintenance instructions for systems developed in connection with TSC projects sponsored by DOT operating administrations or other agencies.

CONTRACTOR REPORTS: Technical information generated in connection with a TSC contact or grant and released under TSC auspices.

TECHNICAL TRANSLATIONS: Information published in a foreign language considered to merit DOT distribution in English.

TECHNICAL REPRINTS: Information derived from TSC activities and initially published in the form of Journal Articles.

SPECIAL PUBLICATIONS: Information derived from or of value to TSC activities but not necessarily reporting the results of individual TSC-programmed scientific efforts. Publications, data compilations handbooks, sourcebooks, and special bibliographies.

1

REPORTS BIBLIOGRAPHY BY SUBJECT

*Public availability to be determined under 5 U.S.C. 552.

1. AERONAUTICS

Includes the following Groups: Aerodynamics; Aeronautics, Aircraft; Aircraft Flight Control and Instrumentation; Air Facilities.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

EN ROUTE AIR TRAFFIC FLOW SIMULATION
DOT–TSC–FAA–71–1
Transportation Systems Center
Accession No. AD 751929
Medeiros, M.F. Jr.
66 p.
January 1971
Flow Control, Air Traffic Control, Central Flow Control Facility, Automation, Information Retrieval, Airport Information, Flow Control Procedures.

This report covers the concept, design, development, and initial implementation of an advanced simulation technique applied to a study of national air-traffic flow and its control by En-Route Air Route Traffic-Control Centers (ARTCC). It is intended to be the first step in gaining an insight into the nature of the national flow-control problem and the utility and limitations of digital simulation to that end.

A flexible digital computer-implemented simulation has been developed which provides a family of model configurations and simulated environments for the U.S. air-traffic system, restricted to positive-controlled high-altitude airspace. Exploitation, validation, and verification of this simulation model are just beginning. Detailed information on the design and program structure is presented in the appendixes.

***HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**
DOT–TSC–FAA–71–2
Transportation Systems Center

Hilborn, E.H.
18 p.
January 1971
Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, Display Problems.

Problems associated with the entry of air-ground-air messages via keyboard for transmission by Data Link are discussed. The ARINC proposal for a keyboard is presented, and an alternative method for coding keys is proposed for comparative evaluation. A sizeable vocabulary of messages requiring a minimum of keying is developed and justified. An alternative layout for a keyboard is proposed and its rationale explained. Some display problems are noted. Plans for experimental evaluation of several keyboard codes and layouts are noted.

CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM. THE BASIC, LEVEL 1 MODEL
DOT–TSC–FAA–71–3
Transportation Systems Center
Accession No. AD733752
de Hollan, A.N., Priver, A.S.
44 p.
April 1971
Conceptual Transportation Systems Model, Flight Simulation, Input Package, Output Package.

A basic conceptual model of the entire Air Transportation System is being developed to serve as an analytical tool for studying the interactions among the System elements. The model is being designed to function in an interactive computer graphics environment which permits rapid alteration of rules and parameters, as well as continuous real-time graphical monitoring of system operations. The model described here is the first member in an evolving hierarchy of increasingly complex models, progressing in the direction of closer approximation to the real-world Air Transportation System.

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DOT–TSC–FAA–71–4
Transportation Systems Center
Accession No. AD-757089
Coonan, J.R., Mpontsikaris, P.
81 p.
March 1971
ATC Event Sequence, ATC Functions.

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THE IMPACT OF INERTIAL NAVIGATION ON AIR SAFETY
DOT–TSC–FAA–71–5
Transportation Systems Center
Accession No. AD733753
Hershkowitz, R.M., O'Mathuna, D., Britting, K.R.
25 p.
May 1971
Inertial Navigation, Collision Risk Model, En Route Navigation Statistics, Blunders.

An analysis of inertial navigation system performance data was carried out to assess the probable impact of inertial navigation on the aircraft collision risk in the North Atlantic region. These data were used to calculate the collision risk between two aircraft flying at the same nominal flight level on adjacent tracks. The inertial system's error sources are treated in a statistical sense to infer the en route error behavior from the terminal error data. Collision risk estimates are derived for easterly and westerly transatlantic flights. The results of this relatively conservative analysis show that there is strong evidence to support the concept that the widespread use of inertial navigators will lead to reduced separation standards in the North Atlantic region while maintaining present safety standards.

COLLISION RISK MODEL FOR NAT REGION
DOT–TSC–FAA–71–6
Transportation Systems Center
Accession No. AD733754
Hershkowitz, R.
55 p.
May 1971
Collision Risk Model, Composite Problem, Vertical Separation, Lateral Separation.

This paper reviews and summarizes the essential features of the collision risk model used to analyze the effects of separation standards on safety for the parallel tracking system employed in the North Atlantic. The derivation of the model is traced from a set of basic assumptions to formulation of various philosophies and a brief set of conclusions and recommendations for future work. Section VII contains a complete reference list.

EVALUATION OF AIR TRAFFIC CONTROL MODELS AND SIMULATIONS
DOT–TSC–FAA–71–7
Transportation Systems Center
Accession No. AD733755
Higgins, L.O., Mpontsikaris, P.

June 1971
Air Traffic Control (ATC), Modeling And Simulation Of ATC, Evaluation Of ATC Models

Approximately two hundred reports were identified as describing Air Traffic Control (ATC) modeling and simulation efforts. Of these, about ninety analytical and simulation models dealing with virtually all aspects of ATC were formally evaluated. The bibliography lists all the reports identified. There is an introduction to, and a summary of the evaluation effort as of this publication. The summary also contains a preliminary indication of which models may be of value for ATC concept evaluation; specifically traffic flow, safety and system loading aspects of proposed concepts. The remainder of the document is a catalog of the written evaluation of the ATC models. The models are divided into seven categories: (A) Airport Surface Traffic, (B) Runway, Departure/Arrivals, (C) Terminal Area, (D) Enroute, (E) ATC Systems (and miscellaneous), (F) Cost-Effectiveness Models, and (G) Safety Related Models. The catalog will be updated periodically.

LINEARIZED MATHEMATICAL MODELS FOR DE HAVILLAND CANADA "BUFFALO & TWIN OTTER" STOL TRANSPORTS
DOT–TSC–FAA–71–8
Transportation Systems Center
Accession No. AD733756
MacDonald, R.A., Garelick, M., O'Grady, J.

Aircraft Math Models, STOL Aircraft Stability & Control.

Linearized six degree of freedom rigid body aircraft equations of motion are presented in a stability axes system.

Values of stability derivatives are estimated for two representative STOL aircraft - the DeHavilland of Canada "Buffalo" and "Twin Otter." These estimates are based on analytical expressions in the report. The combination of the equations of motion and the estimated stability derivatives provides an aircraft model which is useful for Navigation, Guidance and ATC Studies.

Resulting transient responses to control inputs are presented.

PRELIMINARY SURVEY OF POTENTIAL STOL TERMINAL AREA OPERATIONAL REQUIREMENTS
DOT–TSC–FAA–71–9
Transportation Systems Center
Accession No. AD744719
Stevenson, L.E.
38 p.
June 1971
STOL, Terminal Area Operations.

A preliminary survey of potential operational requirements for STOL in the terminal area has been made. The presentation of this survey is in three sections. The first section presents the motivation for the survey, which can be summarized as the necessity for the federal government to have a knowledge of the potential operational requirements of STOL. The second section discusses the markets in which STOL may be found liable. This discussion is limited to those aspects which are necessary to determine the effects of these markets on shaping future STOL operations. The final section consists of a description of terminal area operations as they currently exist, of possible operational changes that may occur exclusive of the introduction of STOL, and then of potential operational requirements of STOL in the terminal area.

SIMULATION MODEL FOR THE PIPER PA-30 LIGHT MANEUVERABLE AIRCRAFT IN THE FINAL APPROACH
DOT–TSC–FAA–71–11
Transportation Systems Center
Accession No. AD733757
Koziol, J.S. Jr.
21 p.
June 1971
Light Maneuverable Aircraft, Autopilot Model, Final Approach, Simulation Studies.

This report describes the Piper PA–30 "Twin Comanche" aircraft and a representative autopilot during the final approach configuration for simulation purposes. The aircraft is modeled by linearized six-degree-of-freedom perturbation equations referenced to the aircraft stability axis. Other equations are presented which derive the body axis rates, velocities and accelerations, and ground referenced velocities (translation equations).

The autopilot is a representative system for automatic ILS approaches from initial localizer track down to decision height. The glideslope system is engaged by approaching the glidepath of constant altitude (usually in the altitude hold mode) on the localizer beam. The pilot must take over manually at the decision height since light aircraft are not normally equipped with automatic flare capability.

The aircraft autopilot model described herein has been used extensively in simulation studies at TSC and exhibits the expected behavior.

*** SIMULATION MODEL FOR THE CONVAIR CV-880 AND BOEING 720 B AIRCRAFT-AUTOPILOT SYSTEMS IN THE APPROACH CONFIGURATION**
DOT–TSC–FAA–71–12
DOT/Transportation Systems Center

Koziol, J.S. Jr.
47 p.
July 1971
Aircraft-Autopilot Model, Simulation Data, Convair CV-880 And Boeing 720 B Aircraft, Flight Control System, Instrument Landing System, Landing Approach

This report presents the basic equations and data required to simulate the Convair CV-880 and Boeing 720 B aircraft-autopilot systems in the approach configuration from altitude and heading hold down to flare. The approach maneuver is discussed in Section I. A fixed point aircraft model is assumed and is presented in Section II. It consists of linearized, rigid body, six-degree-of-freedom perturbation equations referenced to the stability axis, body axis equations, Euler angle equations, trajectory equations and hinge moment equations.

The basic vehicle data, trim data for the approach configuration, and a description of the autopilot for the Convair CV-880 and Boeing 720 B are presented in Sections III and IV respectively. The Boeing 720 B data is incomplete: missing aircraft parameters are noted while missing and unclear autopilot data are discussed in Section IV. This data is currently being obtained from the Boeing Company.

FINAL REPORT: OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 71
DOT–TSC–FAA–71–13
Transportation Systems Center
Accession No. AD733758
Hershkowitz, R.M.

June 1971
Air Traffic Control, Collision Risk Model Inertial Navigation, Separation Standards Surveillance

This report summarizes the oceanic surveillance and navigation analysis performed at Transportation Systems Center under PPA FA–04 for FY 71. Three major efforts are reviewed and discussed herein: (1) a tutorial summary of the NAT/SPG collision risk model; (2) a study of the impact of inertial navigation on air safety; and (3) an investigation of the modeling techniques required to assess the effect of ATC satellite surveillance on separation standards in the North Atlantic region.

REAL-TIME SIMULATION PROGRAM FOR DE HAVILLAND (CANADA) "BUFFALO" AND "TWIN OTTER" STOL TRANSPORTS
DOT–TSC–FAA–71–14
Transportation Systems Center
Accession No. AD74420
MacDonald,R.A., Garelick, M., Haas, J.

June 25, 1971
Aircraft Math Models, STOL Aircraft Stability And Control, Aircraft Simulation.

Simulation models of two representative STOL aircraft—the DeHavilland (Canada) "Buffalo" and "Twin Otter" transports—have been generated.

The aircraft are described by means of non-linear equations that will accommodate gross changes in angle of attack, pitch angle, flight path angle, velocity and power setting. Aircraft motions in response to control inputs and external disturbances are related to Earth-fixed coordinates. The equations are programmed to run in "real time" so that they can be used in conjunction with a manned cockpit simulator. Provisions are made for pilot control inputs to the simulation, and conventional panel display parameters are generated.

The report includes representative simulation results which demonstrate that the simulation is an adequate representation of the two STOL aircraft being modeled.

LARGE SCALE SYSTEMS-A STUDY OF COMPUTER ORGANIZATIONS FOR AIR TRAFFIC CONTROL APPLICATIONS
DOT–TSC–FAA–71–15
DOT/Transportation Systems Center
Accession No. AD733759
Dumanian, J., Clapp, D.
152 p.
June 15, 1971
Computers, NAS Stage A Data Processing, ARTS III Data Processing.

Based on current sizing estimates and tracking algorithms, some computer organizations applicable to future air traffic control computing systems are described and assessed. Hardware and software problem areas are defined and solutions are outlined. System evaluation criteria are presented.

Section 1: delineates the objectives and approach, and furnishes definitions of computer hardware and software;

Section 2: *presents the ATC data processing requirements: the anticipated traffic, the computer processing rates, and the methods for analyzing computer performance;*

Section 3: *describes current computing systems with capabilities for usage in near future ATC applications;*

Section 4: *denotes the algorithms which are to be used in the projected ATC programs;*

Section 5: *sums up the future prospects in ATC data processing, assesses the risks and points out some future work efforts.*

SYSTEM RELIABILITY AND RECOVERY
DOT–TSC–FAA–71–16
DOT/Transportation Systems Center
Accession No. AD733760
Dancy, C.A. III
61 p.
June 15, 1971
Reliability, Recovery, Reconfiguration, Multiprocessor, Fail-safe/Soft.

This study exhibits a variety of reliability techniques applicable to future ATC data processing systems. Presently envisioned schemes for error detection, error interrupt and error analysis are considered, along with methods of retry, reconfiguration, task recheduling and system restart. Reliability data are accumulated on present and planned ATC data processing systems and on certain commercial, military, and experimental computers having features applicable to future ATC tasks.

Included as well are discussions of reliability concepts, methods of reliability determination and criteria for judging system reliability and capability for recovery.

This work is connected with FA–03–1, Large Scale Systems.

TIME/FREQUENCY SYSTEMS
DOT–TSC–FAA–71–17
Transportation Systems Center
Accession No. AD733761
Farr, E.H., Frasco, L.A., Goldfein, H.D., Snow, R.M.
82 p.
June 30, 1971
Time/Frequency, Multipath, ATC Systems, Coding.

This report summarizes the work performed at DOT/TSC on the Time/Frequency ATC System study project. Principal emphasis in this report is given to the evaluation and analysis of the technological risk areas. A survey and description of proposed T/F system is included. The technical risk areas include the effects of multipath on signalling over radio links. Material is presented which bears on the comparitive analysis of T/F with alternative technologies, including satellite and beacon-based system concepts. It is concluded that the most critical problem areas requiring further study are (a) multipath effects on T/F systems, and (b) systems operability under non-ideal conditions leading to graceful degradability.

PROPOSED CONTROL TOWER AND COCKPIT VISIBILITY READOUTS BASED ON AN AIRPORT-AIRCRAFT INFORMATION FLOW SYSTEM
DOT–TSC–FAA–71–18
Transportation Systems Center
Accession No. AD-744718
Ingrao, H.C., Lifsitz, J.R.
43 p.
July 1971
Visibility, Air Traffic Control, Cockpit Display.

The problem of displaying visibility information to both controller and pilot is discussed in the context of visibility information flow in the airport-aircraft system.

The optimum amount of visibility information, as well as its rate of flow and display, depends both on the needs of the pilot during landing and on the air traffic control philosophy (tactical or strategic) chosen.

A rationale is provided to assist in the selection of flow rates and readouts. The relationship of visibility information to the magnitude of terminal information handled by the pilot is discussed. Several display formats are proposed, including one for the traffic controller and three different options for the pilot.

CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM
DOT–TSC–FAA–71–19
DOT/Transportation Systems Center
Accession No. AD733762
Wagner, G.W., Haroules, G.G., Brown, W.E.
47 p.
July 1971
Radiometer.

This report presents a review of accomplishments for the Clear Air Turbulence Detection Program. The objectives, instrumentation, supporting hardware and interfaces leading up to and including the test flights for the reporting period are given.

The ultimate goal of this program is the development of a remote method for detecting and thereby alerting high-altitude, high-speed aircraft in sufficient time to avoid the hazards associated with Clear Air Turbulence, CAT.

DISPERSED PROCESSING FOR ATC
DOT–TSC–FAA–71–20
DOT/Transportation Systems Center
Accession No. AD733763
Paul, G.G., Snow, R.M.
16 p.
June 30, 1971
Dispersed Processing, Air Traffic Control, Remote Tracking, Data Link, Intermittent Positive Control, Discrete Addressing.

An analysis has been made of the potentialities and problems involved in assigning some computer processing and control functions to the remote sites in an upgraded third generation air traffic control system. Interrogator sites offer the most fruitful opportunities for remote processing. The minimal remote processing configuration consists of extraction, compaction, and encoding of locally derived data. With concurrent remote tracking, additional tasks may be added, including roll call generation, data link management, ground communications management, and IPC service. Phased-array management is considered to be the function of a separate dedicated controller. Attention is directed to the need for an "orderwire" net to avoid problems of a floating control.

KEYBOARD AND MESSAGE EVALUATION FOR COCKPIT INPUT TO DATA LINK
DOT–TSC–FAA–71–21
Transportation Systems Center
Accession No. AD744721
Hilborn, E.H.
38 p.
November 1971
Data Link, Air Traffic Control, Message Coding.

The project reported herein studied some methods for implementation of the man-machine interface of Digital Data Link for Air Traffic Control. An analysis of information transfer requirements indicated that a vocabulary of less than 200 words could yield meaningful messages for all routine ATC transactions. Keyboard configurations suitable for one-handed operation to yield alphanumeric outputs were studied and a ten-key character selection layout based upon sequential keying of the first two letters of the phonetic alphabet was developed. Tests with experimental subjects indicated that training time was no longer and keying proficiency at least as good as that achieved with the larger keyset suggested by ARINC.

A second-order mnemonic coding scheme based upon key letters of the words of messages was proposed as a means for reducing the number of required keystrokes to generate such messages.

***ATCRBS IMPROVEMENT PHASE A FINAL REPORT**
DOT–TSC–FAA–71–22
Office of Technology Transport. Sys. Ctr.

Waetjen, R.M., MacKenzie, F.D., Stein, H., Lovecchio, J.A., Kleiman, L.A.

ATCRBS/Air Traffic Control Monopulse/ATCRBS Improvement Study/ATCRBS Modification.

This report presents the results of the first phase of a study of several proposed modifications of the Air Traffic Control Radar Beacon System designed to improve system performance in terms of accuracy, resolution, garbling susceptibility, and reliability. The modifications considered are frequency tagging of the received transponder signal, transponder response modifications synchronous azimuth scan of interrogator antennas, interrogator antenna length increase, and utilization of sum and difference patterns of the interrogator antennas such as beam sharpening on transmit and receive and monopulse on receive.

AN INVESTIGATION OF MICROWAVE LANDING GUIDANCE SYSTEM SIGNAL REQUIREMENTS FOR CONVENTIONALLY EQUIPPED CIVILIAN AIRCRAFT
DOT–TSC–FAA–71–24
DOT/Transportation Systems Center
Accession No. AD737339
Lanman, M.H. III
171 p.
June 1971
Microwave Landing System, Landing Guidance System, Scanning Rate, Scanning Beam ILS.

This report describes efforts leading to the determination of minimum suitable scan rates for the azimuth and Elevation #1 functions of the microwave Landing Guidance System (LGS) proposed by RTCA SC-117, based on performance requirements of two conventionally equipped civilian aircraft. Two complementary methods are used; one involving a full nonlinear digital simulation, the other involving direct covariance matrix propagation. Wind and turbulence models, aircraft models and LGS models are described in detail. Safety and pilot acceptability criteria for performance evaluation are developed. Results are presented in terms of minimum scan rate maximum beam noise constraints. Limitations of the methods and data are also discussed and required further work outlined.

VISIBILITY CONCEPTS AND MEASUREMENT TECHNIQUES FOR AVIATION PURPOSES
DOT–TSC–FAA–71–25
Transportation Systems Center
Accession No. AD744688
Schappert, G.T.
104 p.
July 1971
Visibility, Runway Visual Range, Atmospheric Transmission, LIDAR.

This is the final report #1 of the Visibility Measuring Devices project, PPA-FA-15-Q, carried out for the Federal Aviation Administration at the Transportation Systems Center, both under the Department of Transportation.

The report reviews present techniques for measuring atmospheric transmittance and its conversion to runway visual range. The response of the pilot to visual cues used in determining the visibility is discussed as a function of his cockpit environment. The lights utilized by the FAA as targets for visibility determinations are discussed and used in the computations.

New techniques for visibility measurements and new concepts and definitions are discussed and analyzed. The emphasis is on techniques for measuring slant visual range by means of optical remote sensing devices. Various problems relating to atmospheric modeling, signal processing, and eye safety aspects are discussed.

ACCURATE SURVEILLANCE IN THE TERMINAL AREA
DOT–TSC–FAA–71–26
Transportation Systems Center
Accession No. AD-749907
Kulke, B., Minkoff, R.T., Haroules, G.G.
43 p.
September 1971
Approach Surveillance, Air-Derived Data, Parallel-Runway Spacing.

The problem of deriving surveillance information from the MLS has been analyzed in terms of the available air-to-ground communication links. The results of this study indicate that the use of this approach is feasible and it is recommended that the configuration based on the DABS data link be included in the upgraded third-generation design to meet the high-density terminal-area surveillance requirements.

THE CALCULATION OF AIRCRAFT COLLISION PROBABILITIES
DOT–TSC–FAA–71–27
Transportation Systems Center
Accession No. AD744722
Bellantoni, J.F.
41 p.
October 1971
Collision, Collision Probability, Air Traffic Control, Safety.

The basic limitation of air traffic compression, from the safety point of view, is the increased risk of collision due to reduced separations. In order to evolve new procedures, and eventually a fully automatic system, it is desirable to have a means of calculating the collision probability for any prescribed flight paths. This paper extends the statistical-probabilistic method of collision probability calculation, which has been limited to parallel, straight line flight paths, to arbitrary flight paths and vehicle shapes. The general formula is specialized to the cases of large relative velocity, non-zero relative velocity, zero relative velocity and spherical collision surface. The formulas are applied to independent curved landing approaches to parallel runways.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA
DOT–TSC–FAA–71–29
Transportation Systems Center
Accession No. AD737511
Kalafus, R.M., Bishop, G.J., Haroules, G.G.
312 p.
September 1971
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Planar Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Propagation, Microwave Sources.

The feasibility of the use of phased arrays for the proposed microwave landing guidance system (MLGS) is discussed. The effects of the use of planar and conical beam guidance on the choice of system configurations is investigated. The design of an experimental antenna to demonstrate feasibility is given.

CHARACTERISTICS OF A SIGNAL DATA CONVERTER FOR A MULTI-RUNWAY VISIBILITY MEASURING SYSTEM
DOT–TSC–FAA–72–1
Transportation Systems Center
Accession No. AD744873
Ingrao, H.C., Lifsitz, J.R.
30 p.
October 1971
Visibility, Air Traffic Control, Signal Data Converter.

The characteristics of a signal data converter (SDC) are developed with application to airport visibility measuring systems. The SDC is discussed in the context of an evolutionary growth of the visibility measuring system stemming from the present FAA RVR measuring technique. A new SDC will be employed which will use state-of-the-art concepts and will be capable of handling future visibility measuring systems outputs to provide more comprehensive visibility information and display. Included in these outputs will be simultaneous signals from as many as nine transmissometers distributed three each along three runways. In addition, ground illuminance sensors will provide more background discrimination than the present day-night switch. Finally, the system will be expected to handle inputs from several kinds of target lights and to calculate and output for display several specialized visibility values (RVR, SVR, TVR). The SDC will be capable of modular expansion such that the capability for such future tasks will be available.

VORTEX SENSING TESTS AT NAFEC
DOT–TSC–FAA–72–2
Transportation Systems Center
Accession No. AD-749908
Burnham, D., Hallock, J., Kodis, R., Sullivan, T.
72 p.
January 1972
Vortex, Acoustic, Sensor, Pressure.

This report describes the results of a series of tests conducted for the FAA at NAFEC by the DOT/Transportation Systems Center. The test objectives were to determine and evaluate some of the characteristics of three experimental techniques for the remote sensing of the wing-tip vortices generated by heavy commercial and military aircraft. These techniques involved (1) a pulsed, bistatic acoustic detection and ranging system (referred to as an acoustic radar); (2) a ground level pressure sensor; and (3) a ground level hot-wire anemometer. The tests were conducted both in conjunction with the instrumented tower and at the end of runway 13. Data were obtained and analyzed for a variety of aircraft including the DC-7, B-747, C-141 and C-5A. Results in the form of altitudes and times of tower hits and vortex tracks are presented and compared to the tower data wherever possible.

ATC OPERATIONAL ERROR ANALYSIS
DOT–TSC–FAA–72–3
Transportation Systems Center

Hynes, R.J.
8 p.
January 1972
ATC, Blunders, Human Errors, Operational Errors.

The primary causes of operational errors are discussed and the effects of these errors on an ATC system's performance are described. No attempt is made to specify possible error models for the spectrum of blunders that can occur although previous results are reviewed. Methods of handling blunder effects in preliminary evaluation experiments are outlined and the requirements for future work in the area of blunder analysis are discussed.

PATH CHANGING METHODS APPLIED TO THE 4-D GUIDANCE OF STOL AIRCRAFT
DOT–TSC–FAA–72–5
Transportation Systems Center
Accession No. AD-744874
Hynes, R.M., Capen, E.B., Stevenson, L.E.
42 p.
November 1971
4-D Guidance, Flight Path Planning, Steering Laws.

Prior to the advent of large-scale commercial STOL service, some challenging navigation and guidance problems must be solved. Proposed terminal area operations may require that these aircraft be capable of accurately flying complex flight paths, and in some situations, maintaining a time of arrival envelope at waypoints along these paths (4-D guidance capability). This report discusses problems that arise in performing 4-D guidance and presents the results of an initial investigation of two candidate 4-D guidance schemes that are based on the aircraft having a limited amount of protected airspace for maneuvering. Preliminary analysis and simulation results are presented and future work on the 4-D guidance of STOLS is outlined. The results although presented for STOLS are applicable also to the 4-D guidance of any RNAV equipped aircraft.

MONOPULSE AZIMUTH MEASUREMENT IN THE ATC RADAR BEACON SYSTEM
DOT–TSC–FAA–72–6
Transportation Systems Center
Accession No. AD-746943
Kulke, B., Rubinger, B., Haroules, G.G.
121 p.
December 1971
ATC Radar Beacon System, Monopulse Azimuth Measurement, Error Analysis, Sum-Difference Techniques.

A review is made of the application of sum-difference beam techniques to the ATC Radar Beacon System. A detailed error analysis is presented for the case of a monopulse azimuth measurement based on the existing beacon antenna with a modified feed network. A comparison of the total expected monopulse error with the azimuth error of the existing ATCRBS indicates that there is little to be gained by a monopulse modification. Without beam sharpening, the single-reply monopulse accuracy is less than that of the existing system. With beam sharpening and/or by using multiple reply information, the azimuth error error is estimated to be as little as 1 or 2 Azimuth Change Pulses (ACP's), compared to 3 ACP's measured error for the Common Digitizer. However, the monopulse modification implies a considerable increase in system cost and complexity, and the estimated accuracy has not so far been demonstrated in the field. A monopulse modification for azimuth measurement in ATCRBS therefore is not recommended. In terms of fruit reduction, an advantage is obtainable by utilizing sum-difference techniques for artificial beam sharpening, but other solutions may be preferable.

THE ILS SCATTERING PROBLEM AND SIGNAL DETECTION MODEL
DOT–TSC–FAA–72–7
Transportation Systems Center
Accession No. AD746944
Chin, G., Jordan, L., Kahn, D.
105 p.
February 1972
ILS, Scattering Theory, Current Deviation Indication, Derogation, Receiver Model, Doppler Shift, DDM.

The construction of a mathematical model of The Instrument Landing System (ILS) multipath problem has been undertaken. This report presents the theoretical basis for any such model, a critique of previous models and newly achieved developments in ILS model construction.

EVALUATION OF THE FAA ADVANCED FLOW CONTROL PROCEDURES
DOT–TSC–FAA–72–8
Transportation Systems Center
Accession No. AD7447862
Bellantoni, J.F., Coonan, J.R., Medeiros, M.F.
215 p.
January 1972
Flow Control, Advanced Flow Control Procedures, Air Traffic Control, Central Flow Control Facility.

This report is an evaluation of the present FAA Advanced Flow Control Procedures (AFCP), based on data gathered from its implementation on February 5, 1971 and on a fast-time digital simulation of traffic feeding into the NY airports on that day. The report discusses the effectiveness of AFCP in theory, in the February 5 case study, and as modelled in the simulation. Recommendations are made 1) to retain the concept, 2) to modify the procedures, 3) to modify the computer program, and 4) to conduct further research.

CONSIDERATIONS ON THE RELATIONSHIP BETWEEN WHITE AND RED CENTER LINE RUNWAY LIGHTS AND RVR
DOT–TSC–FAA–72–9
Transportation Systems Center
Accession No. AD-761119
Horner, J.L.
26 p.
January 1972
Visibility, Visual Range, RVR.

The runway visual range (RVR) for a Type L-850 bidirectional centerline runway light has been calculated for the red and white output ports at three different current settings for both day and night illuminance thresholds. The calculations are based on certain parameters measured in our laboratory on a sample light. The resulting RVRs are compared to the standard RVRs based on the High Intensity Runway Light (HIRL). An analysis is also included on the error introduced by ignoring the spectral transmittance of the atmosphere.

A SURVEY TO DETERMINE FLIGHT PLAN DATA AND FLIGHT SCHEDULE ACCURACY
DOT–TSC–FAA–72–10
Transportation Systems Center
Accession No. AD744876
Coonan, J.R.
125 p.
January 1972
Flow Control, Terminals, Enroute, Sectors, Position Reports.

This survey determined Operational Flight Plan Data and Flight scheduling accuracy vs. published schedules and/or stored flight plan data. This accuracy was determined by sampling tracer flights of varying lengths, selected terminals, and high altitude sectors; then comparing this data with stored computer data, thus, revealing average delay areas. This information will aid operational analysts and programmers to construct flow control software programs.

MODULATION AND CODING FOR A COMPATIBLE DISCRETE ADDRESS BEACON SYSTEM
DOT–TSC–FAA–72–12
Transportation Systems Center

Goldfein, H.D., Frasco, L.A.
45 p.
February 1972
DABS, ATCRBS, Modulation, Coding, Control Algorithms.

One of several possible candidate configurations for the Discrete Address Beacon System is described. The configuration presented is compatible with the Air Traffic Control Radar Beacon System, and it provides for gradual transition from one system to the other. A discussion of the effects of modulation and coding on the performance of the candidate DABS system is presented, and an experimental design is described. Some studies which will be required for detailed design are described.

AIRCRAFT WAKE VORTEX SENSING SYSTEMS
DOT–TSC–FAA–72–13
Transportation Systems Center
Accession No. AD744864
Burnham, D., Gorsetin, M., Hallock, J., Kodis, R., McWilliams, I., Sullivan, T.
65 p.
June 30, 1971
Vortec, Acoustic, Sensor.

This report summarizes and analyzes techniques, both active and passive that could be used to detect and measure air movements associated with wingtip vortex generation within an area or throughout a volume of terminal airspace. This study also indicates one or more useable techniques with an appraisal of expected performance and inherent limitations. Results of preliminary feasibility tests employing available technology are presented.

This report also discusses the Systems Studies to be performed on the wake vortex sensing problem. The major effort is directed toward the location of wake vortex hazard, and the generation of monitoring requirements for safe operation in the airport terminal environment.

ASDE-2 TRANSMITTER MODIFICATIONS
DOT–TSC–FAA–72–16
Transportation Systems Center
Accession No. AD751927
Guarino, H.R.
29 p.
September 1972

In October 1971, TSC was assigned the task of assessing the current ASDE-2 maintenance problems. After studying the available statistics, obtained from various airports, it was quickly concluded that the preponderance of ASDE-2 radar failures originated in the modulator-transmitter section where the low mean time between failures was controlled by the following inter-related factors: 1) An under-sized hydrogen thyratron driver for the power amplifier; 2) An inadequate trigger pulse amplifier output; 3) Poor operating conditions for the power amplifier tubes. The report analyzes these and other engineering inadequacies and then describes in detail the modification of one channel of an ASDE radar, at TSC. To date the system has been operating for several months without any modulator failures. This is nearly fifty times longer than previous mean time between failures.

ALL-WEATHER-LANDING OPERATIONS BIBLIOGRAPHY
DOT–TSC–FAA–72–19
Transportation Systems Center
Accession No. AD754267
Morris, J.M.
52 p.
June 1972
Landing, All-Weather Landing, Category III Operations, Low-Visibility.

The bibliography provides a selected coverage of several topic areas within the general subject of all-weather landing. The period covers the recent years of 1966 through 1971. The areas are as follows:
Approach and Landing,
Human Factors,
Navigation and Display Systems,
Requirements and Standards,
Safety, Reliability, and Maintenance.

ADVANCED COMPUTER ARCHITECTURE FOR LARGE-SCALE REAL-TIME APPLICATIONS
DOT–TSC–FAA–72–21
Transportation Systems Center
Accession No. AD-758697
Wang, G.Y.
186 p.
April 1973
Parallel Processor, Associative Processor, Multiprocessing, Memory Allocation, Dynamic Task Scheduling, Graph Modelling, Air Traffic, Real-Time Systems.

In this study the air traffic control automation is identified as a crucial problem which provides a complex, real-time computer application environment. A novel computer architecture in the form fo a pipeline associative processor is conceived to achieve greater performance improvement over the present air traffic control system by parallel processing. This new processor is structured into a multiprocessor configuration for reliability enhancement. Problems associated with multiprocessors are identified with emphasis on execution time anomalies and memory conflict. A direct graph model is used for analysis from which simple heuristics are established for memory allocation and dynamic task scheduling to achieve optimal performance with minimal system overhead. These schemes are simulated and the results obtained follow closely the predicted system behavior.

VORTEX SENSING TESTS AT LOGAN AND KENNEDY AIRPORTS
DOT–TSC–FAA–72–25
Transportation Systems Center
Accession No. AD-753849
Sullivan, T., Burnham, D., Kodis, R.
136 p.
December 1972
Vortex Sensing Tests, Acoustic Sensors, Wind Pressure Sensors, Aircraft Wake Vortices.

This report describes a series of tests of wake vortex sensing systems at Logan and Kennedy Air-

ports. Two systems, a pulsed acoustic radar (acdar) and an array of ground level pressure sensors, were tested. Site restrictions limited the Logan work to preliminary evaluation. The tests at Kennedy Airport established the general operating characteristics of both tracking systems. It was found that the vortices of all commonly used commercial aircraft, though with varying degrees of sensitivity. The pressure sensors generally behaved best during conditions of low to moderate winds when the vortices could often be tracked laterally up to several hundred feet from the aircraft flight path.

INSTRUMENT LANDING SYSTEM SCATTERING
DOT–TSC–FAA–72–28
Transportation Systems Center
Accession No. AD754517
Chin, G., Jordan, L., Kahn, D., Morin, S.
148 p.
December 1972
ILS, Scattering Theory, Current Deviation Indication, Derogation, Receiver Model, Doppler Shift, DDM.

The construction of a mathematical model of the Instrument Landing System (ILS) multipath problem has been undertaken. This report presents the theoretical basis for such a model, and newly achieved developments in ILS model construction.

SIGNAL ANALYSIS FOR AEROSAT
DOT–TSC–FAA–72–29
Transportation Systems Center
Accession No. AD758407
Frasco, L.A.
80 p.
August 1972
Signal Design, Multipath, AEROSAT, Avionics.

This report addresses signal design for the AEROSAT system. Candidate data and surveillance modems are analyzed for L-Band avionics. Detailed theoretical analyses are presented of the effects of the oceanic satellite-aircraft channel on data modem performance. In addition, an L-Band avionics transceiver is proposed to meet the requirements of the Experimentation and Evaluation Phase of AEROSAT. The proposed avionics is flexible and easily adaptable to a variety of operational and access control concepts. A task plan outline is presented for an improved modem task for the following year.

MICROWAVE LANDING SYSTEM SIGNAL REQUIREMENTS FOR CONVENTIONAL AIRCRAFT
DOT–TSC–FAA–72–30
Transportation Systems Center
Accession No. AD754892
Lanman, M.H. III
146 p.
July 1972
Microwave Landing System, MLS, All Weather Landing, Automatic Landing.

The results of analysis directed towards determining Microwave Landing System (MLS) signal requirements for conventional aircraft are discussed. The phases of flight considered include straight-in final approach, flareout, and rollout. A limited number of detailed problems in performance analysis are studied. Data from computer simulation, covariance propagation and system optimization, with a careful selection of variables provides a means for generalizing from the results of specific experiments to more comprehensive functional, data rate, beam noise, and control system requirements for automatic landing in turbulence.

Conclusions point toward the requirements for a evaluation of the MLS as sole primary landing aid; the problem arises during flareout in turbulence, when elevation information is inadequate to maintain precise sink rate control. Minimum suitable data rate and maximum allowable noise for final approach are also recommended.

O'HARE ASDE-2 RADOME PERFORMANCE IN RAIN; ANALYSIS AND IMPROVEMENT
DOT–TSC–FAA–72–32
Transportation Systems Center
Accession No. AD-757744
Weigand, R.M.
80 p.
March 1973
Radome, ASDE-2, O'Hare.

The operational performance of the ASCE-2 radar at O'Hare Airport is severly limited during periods of moderate to heavy rainfall. Using the system performance specifications, an estimate has been made of the ASDE-2's tolerance to power loss and degradation of its circular polarization produced by a radome. Three aspects of the O'Hare radome have been examined as potential sources of excessive loss. These are (a) the metal space frame, (b) the dielectric constant and loss tangent of the membrane material, and (c) the membrane surface properties. It has been concluded that the membrane surface properties permit a water film buildup during rain which will cause severe losses. Hydrophobic coatings were tested in the laboratory before and after exposure to the environment. Two coating materials were found to retain their water shedding properties for several months. One of these coating materials was applied to the O'Hare ASDE-2 radome. Since coating the radome, very substantial improvement in operation has been noted during periods of rainfall.

A METHOD FOR THE STUDY OF CATEGORY III AIRBORNE PROCEDURE RELIABILITY
DOT–TSC–FAA–72–35
Transportation Systems Center
Accession No. AD758698
Feehrer, C.E.
40 p.
March 1973
Category III Systems, All-Weather Landing, Low-Visibility Operations.

A method for the study of Category III airborne-procedure reliability is presented. The method, based on PERT concepts, is considered to have utility at the outset of a procedure-design cycle and during the early accumulation of actual performance data. For purposes of illustration, the method is exercised on a procedural set drawn from an earlier study of all-weather-system reliability.

HUMAN FACTORS EXPERIMENTS FOR DATA LINK: INTERIM REPORT I
DOT–TSC–FAA–72–37
Transportation Systems Center
Accession No. AD754273
Hilborn, E.H.
72 p.
November 1972
Air Traffic Control, Data Link, Displays, Synthetic Speech, Message Coding, Simulators.

This report discusses three experiments aimed at providing information pertinent to the Data Link Operational Experiments Program. Section 1. describes the evaluation of the WIDCOM, a visual display, and a voice synthesizer for providing ATC information to pilots in a GAT-1 simulator. Section 2. is concerned with the evaluation of the intelligibility of the individual words in the vocabulary of the voice synthesizer. Section 3. describes an experiment to provide information as to possible coding formats for short message ATC commands and advisories.

The three sections of the report are independent in content, having as a common denominator their applicability to the Data Link Program.

CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM
DOT–TSC–FAA–72–38
Transportation Systems Center
Accession No. AD757074
Wagner, G.W., Haroules, G.G., Brown, W.E.
94 p.
February 1973
Clear Air Turbulence Radiometer.

The report presents the accomplishments of the Clear Air Turbulence Detection Program for the Period July 1, 1971 to June 30, 1972. The experimental effort during this time period was devoted mainly to the flight test program, acquisition of flight data and evaluation of flight data obtained. The program established the ability of the DOT/FAA detection system to sense turbulence and verify the encounter by means of other on-board atmospheric sensors. The total of 15 flights represents 31 flight hours and 26 hours of data tape. Eight of the turbulence encounters reported during these flights are considered significant and ranged from moderate to severe. All test flights were conducted locally (within 350 miles) from NASA/Flight Research Center, Edwards, California.

Instrumentation, supporting hardware and interfaces are briefly reviewed. Improvements to the measurement technique are also presented.

Included are curves, tables and comments which support the events during particular flights where the data indicates changes in atmospheric conditions were sensed before and during turbulence encounters. The conclusions emphasize the need for additional flight tests that are coordinated with meteorological predictions of turbulence condtions in the moderate to severe classifications.

Operational experience gained with each flight allowed problems in equipment functions and data evaluation to be assessed and corrected so as to improve the "follow-on" flights that were conducted. Design improvements are recommended for existing and future sensor systems as well as use of more efficient methods of data reduction as a result of this experience.

A continuation of the flight test program is planned for the coming year by FAA.

CONTROLLER-REPORTED PERFORMANCE DEFECTS IN THE AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (1971 SURVEY)
DOT–TSC–FAA–72–40
Transportation Systems Center
Accession No. AD758699
Rubinger, B.
200 p.
March 1973
Air Traffic Control, Radar Beacon System, Performance Survey, Beacon Discrepancy Reports, Controller Fault Reports, Beacon System Performance.

This report analyzes the returns from a recent ATC performance survey initiated by the Beacon System Interference Problem Subgroup. The survey began on 27 November 1971 and lasted for two weeks. Participation was limited to 37 facilities with problems considered representative of the entire system; included were enroute centers, civilian towers and military air traffic installations.

Examination of the deficiency data revealed that the most common nationwide problem was the loss of beacon coverage for a short period of time. This is followed by broken target slash, ring around, loss of coverage for long time, and false targets. The returns are sorted to identify the type of aircraft involved in the reported discrepancies. For each aircraft the data is futher refined on the basis of error category, and the performance summarized by an error matrix. Attention is focused on the air carriers and the beacon discrepancies associated with this group are catalogued. Air traffic statistics are derived and employed to normalize the discrepancy information. The resulting data reveals significant performance variation among the different air carriers, as well as between different aircraft. Finally, the manner in which the survey was conducted is discussed, and recommendations made for automating future performance tests.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA VOLUME I
DOT–TSC–FAA–72–41
Transportation Systems Center
Accession No. AD-755682
Kalafus, R.M., Bishop, G.J., LaRussa, F.J., Pantano, P.J., Wade, W.R., Yatsko, R.S.
246 p.
February 1973
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Microwave Sources.

The use of phased arrays for the proposed landing system (MLS) is discussed. Studies relating to ground reflections, near field focusing, and phased-array errors are presented. Two experimental antennas which were fabricated and tested are described. Complete component specifications as well as test results are included.

The first annual report, having the same title, was published in September 1971 as report number FAA-RD-71-87 (TSC-FAA-71-29).

This report, the second annual report, is printed in two volumes. Volume I contain section 1 through 7.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA VOLUME II
DOT–TSC–FAA–72–41
Transportation Systems Center

Kalafus, R.M., Bishop, G.J., LaRussa, F.J., Pantano, P.J., Wade, W.R., Yatsko, R.S.
206 p.
February 1973
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Microwave Sources.

The use of phased arrays for the proposed landing system (MLS) is discussed. Studies relating to ground reflections, near field focusing, and phased-array errors are presented. Two experimental antennas are described which were fabricated and tested. Complete component specifications are included, as well as test results.

The first annual report, having the same title, was published in September 1971 as report number FAA-RD-71-87 (TSC-FAA-71-29). Volume II contains Appendixes A through C.

FLIGHT PLANS: STOL AVIONICS FLIGHT-TEST PROGRAM
DOT–TSC–FAA–73–3
Transportation Systems Center

PGS STOL Program Office
288 p.
April 1973
STOL, Area Nav-VOR/DME, DME/DME, LORAN C, MODILS.

This document presents the flight-test plans for the U.S. DOT/Transportation Systems Center STOL Avionics Flight-Test Program. Tests described include:

a. Shakedown Test, Hanscom Field,
b. NAFEC Checkout Tests,
c. Area Navigation Tests,
d. Approach Flight Tests,
e. VOR Filter Tests,
f. Land/Sea Interface Tests,
g. Maneuver Flight Tests,
h. Philadelphia Noise Tests,
i. Northeast Corridor Tests,
j. Mountain Region Tests, and
k. New York City Tests.

HUMAN FACTORS EXPERIMENTS FOR DATA LINK INTERIM REPORT NO. 2
DOT–TSC–FAA–73–6
Transportation Systems Center
Accession No. 760401
Hilborn, E.H., Devanna, L.R.
46 p.
April 1973
Air Traffic Control, Data Link, Message Coding.

Two experiments involving the coding of Air Traffic Control messages for Digital Data Link transmission are reported. Reaction times and error rates to slide presentations were recorded for both experiments as a means for assessing the relative meaningfulness of messages.

Experiment I studied the difference between long and short abbreviations with and without spaces. The need for the use of spaces was demonstrated. The experiment also indicated that with proper spacing, short and somewhat cryptic abbreviations were as useful as the longer and seemingly more meaningful abbreviations, even with only brief training of the experimental subjects.

Experiment II provided a procedural variation using the same stimulus material as that reported in Section III of Report FAA-RD-72-150, with generally comparable results. It was again determined that for short ATC messages differences in type font were not significant, that arrows were generally better than words for altitude and heading commands, that a format of three short lines was better than one extended line, and that "L" and "R" as heading commands in messages such as "HDGL230" were extremely difficult to comprehend.

ENGINEERING & DEVELOPMENT PROGRAM PLAN-AIRPORT SURFACE TRAFFIC CONTROL
FAA–ED–08–1
Transportation Systems Center

Airport Surface Traffic Control Program Office
162 p.
April 1973
Airports, Surface Traffic Control, Surveillance Radar, Trilateration, Loop Detectors, Guidance Devices Development Plan.

Background, requirements, system descriptions, task descriptions, activities, schedules and funding levels are presented for the Airport Surface Traffic Control (ASTC) program for the years 1972-1979. Systems, subsystems proposed concepts and equipments are to be defined and specified in a system context and will then be designed, developed tested, and evaluated for introduction, in modular fashion into the existing airport environment. Modular structure of the system will permit system configurations to be tailored to the needs of the individual airport and will permit modular expansion of either capacity or function to meet the airport's needs as they evolve with time.

A PRELIMINARY REQUIREMENTS ANALYSIS FOR AIRPORT SURFACE TRAFFIC CONTROL SYSTEMS
FAA–RD–73–6
The MITRE Corporation

Baran, G., Bales, R.A., Koetsch, J.F., Le Van, R.E.
194 p.
January 1973
Airport Surface Traffic Control, Airport Capacity, Air Traffic Control.

This report summarizes the results of a preliminary ASTC (Airport Surface Traffic Control) requirements analysis. The analysis was performed under a TSC/DOT contract and its scope was restricted. Consequently, the results shown are based on limited data and additional follow-on work by TSC is planned.

The study concentrated on the analysis of the ASTC requirements at three airports (Boston-Logan, Los Angeles and Chicago O'Hare) to obtain baseline data, and extrapolated these results to an additional six airports (Seattle-Tacoma, Bradley, Cleveland, Detroit,

Pittsburgh and Philadelphia) using data-of-record and the results of the baseline airport analysis.

The results of the study indicate a need for immediate improvement of the ASTC system in the 1970-1980 period at the baseline airports, with the need for improvements during peak periods at the Chicago O'Hare Airport under all visibility conditions, and at Boston and Los Angeles in poor visibility conditions. Similar results are obtained by extrapolation for the other six airports surveyed in the course of this study, with the requirements for improvement being generally less critical with respect to the time of their implementation.

The primary measures that were used to determine the requirements for improvements are; controller communication workload and communication channel overloads, the controller capability to handle simultaneously the traffic required to achieve operational rates dictated by traffic demand, and controller capability to accept and release runway traffic with small headways, relative to the existing and/or projected traffic demand.

A preliminary evaluation of the value of potential ASTC improvements indicates that surveillance improvement, coupled with procedural changes, would result in the greatest capability increase. This is followed, in terms of potential payoff, by automation of the conflict-resolution function.

A requirement for improvement of the traffic flow networks (taxiway concrete) exists and may be the major factor determining the feasibility, costs, and payoff of ASTC improvements.

FEASIBILITY ANALYSIS OF AN AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (ATCRBS) BASED SURFACE TRILATERATION SURVEILLANCE SYSTEM
FAA–RD–73–75
The MITRE Corporation

Vinatieri, J.D.
238 p.
June 1973
ATCRBS, ASDE, Ground Surveillance.

Analysis indicates there are feasible methods for achieving surveillance of vehicles on the airport surface by means of time-of-arrival measurements of the vehicle's ATCRBS Transponder reply at three or more receiver sites. Some methods require modification to aircraft equipment while others do not. Performance will be superior with modification to aircraft equipment. On the other hand, the number of vehicles capable of participating in the system will be smaller. The principle problems to be overcome in system design are the potential garbling of replies through fruit responses, multipath responses, and responses from more than one vehicle to a single interrogation. The analysis indicates that techniques exist to overcome these effects with sufficient promise to warrant an austere implementation of a Data Acquisition Subsystem.

Contained herein is a definition of an ATCRBS Based Surface Surveillance System, analyses of various problems and techniques to achieve a satisfactory Data Acquisition Subsystem, and criteria for conducting a test program for further verification of feasibility and design.

***PERFORMANCE PREDICTIONS FOR A PARABOLIC LOCALIZER ANTENNA ON RUNWAY 28R–SAN FRANCISCO AIRPORT**
FAA–RD–73–81
Transportation Systems Center

Jordan, L., Kahn, D., Lam, S., Morin, S., Newsom, D.
27 p.
June 1973
Instrument Landing Systems, Localizer Systems, Parabolic Antennas, Course Derogation.

The TSC ILS localizer model is used to predict the performance of the Texas Instruments "wide aperture" parabolic antenna as a localizer system for runway 28R at San Francisco International Airport. Course derogation caused by the new American Airlines hangar is calculated under the assumption that this structure is a metallic perfect reflector. It is found that the TI System operated with a "capture effect ratio" of 10 dB does not meet Category I requirements. If it is possible to operate the system within equipment limitations at a 16 dB capture effect ratio, performance should be adequate for Category I, but is still inadequate for Category II. This performance is inferior to that predicted for the Alford 22/8 array for the same situation in an earlier study.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

PROGRESS ON THE RAM WING CONCEPT WITH EMPHASIS ON LATERAL DYNAMICS
DOT–TSC–FRA–71–7
Transportation Systems Center

Barrows, T.M.
69 p.
June 1971
Ram Wing, Ground Effect, Lateral Dynamics.

Theoretical and experimental efforts conducted at TSC in the ram wing program are described. Glide Tests were performed using a simple ram wing model operating in an open rectangular trough 50 feet long. Lift drag ratios of 13 were recorded, and a low-frequency roll oscillation was observed. A theorectical model for a flat-plate airfoil in a rectangular trough of infinite depth is described and compared with existing theories and experimental data. The lateral dynamics of tracked vehicles of this type are reviewed and the most important stability parameters are identified.

It is recommended that future research continue to focus on lateral dynamics and that careful experimental measurements be made for the stability derivatives.

ANALYTICAL STUDIES OF THE LIFT AND ROLL STABILITY OF A RAM AIR CUSHION VEHICLE
DOT–TSC–FRA–72–10
Transportation Systems Center
Accession No. PB-219820
Barrows, T.M.
68 p.
December 1972
Ram Wing, Ram Air Cushion, Tracked Air Cushion Vehicle.

A ram air cushion vehicle (a type of ram wing) is described schematically and compared with a conventional air cushion vehicle design. The nonlinear equations for the flow in the cushion region are derived. A review is made of the most recent literature on the subject of wings operating in a rectangular channel, and an approximate solution is developed which shows the relative effects of momentum and viscosity on the pressure distribution. Several analytic solutions are presented which show the effect of a small roll angle on the flow pattern; equations for the rolling moment coefficient are also obtained. It is recommended that future efforts be aimed at developing proper numerical techniques which can solve the nonlinear flow relations and that recent experimental efforts to obtain the lateral stability coefficients be continued and expanded.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
WASHINGTON, D C 20590

FLIGHT TEST EVALUATION AND ANALYSIS OF AN OPTICAL IR PWI SYSTEM
DOT–TSC–NASA–72–1
Transportation Systems Center

Phillips, C.O., Concannon, P.A., Brandel, D., Meyer, E.
45 p.
June 30, 1972
Pilot Warning Instrument, Collision Avoidance, Electro Optical PWI System, Optical IR PWI System

This report documents the flight test results of the optical infrared (IR) Pilot Warning Instrument (PWI) system conducted by the Transportation Systems Center as part of an FAA/NASA PWI development program. The test program is described and the flight test data presented. The data is analyzed and used to calibrate a model that is developed to characterize the system performance. The cumulative probability of detection versus range for a given system threshold is calculated and compared with the PWI performance specification defined by the Collision Prevention Advisory Group (COPAG). The comparison indicates that the Optical IR PWI system tested met the COPAG specifications for a detection likelihood of 95% for a 1 nmi range for an appreciable fraction of the testing time. Even under the worst testing conditions encountered, the range at which this detection likelihood occured was sufficiently large to demonstrate feasibility and to recommend a continuation of the development effort for this approach. A series of recommendations for improving system performance and obtaining additional information needed to characterize that performance are included.

LABORATORY EVALUATION OF FECKER AND LORAL OPTICAL IR PWI SYSTEMS
DOT–TSC–NASA–71–5
Transportation Systems Center
Accession No. N71-13351
Gorstein, M., Hallock, J.N., Houten, M., McWilliams, I.G.
81 p.
February 1971
Electro-Optical PWI, Flashing Xenon Strobe, Fault Correction, Calibrate In Azimuth Elevation And Range.

Flight hardware and a flight test evaluation of two Electro-Optical Pilot Warning Indicators, using a flashing xenon strobe and silicon detectors as cooperative elements, were prepared by the previous NASA group prior to the closure of ERC in June 1970. Several design deficiencies are pointed out. The present laboratory evaluation program, which provides the ideal environment for performing the most detailed studies of the PWI system, has corrected these faults which prevented the equipment from operating, and has calibrated the sensitivity of both systems in azimuth elevation and range.

OFFICE OF THE SECRETARY
OF TRANSPORTATION
WASHINGTON, D C 20590

A THEORY OF AIRCRAFT COLLISION AVOIDANCE SYSTEM DESIGN AND EVALUATION
DOT–TSC–OST–71–4
Transportation Systems Center

Koenke, E.J.
184 p.
March 1971
Anti-Collision System, Collision Avoidance, Air Traffic Models, Collision Detection And Avoidance, Traffic Model Formulations (Air).

The problem of aircraft anti-collision system design and evaluation is discussed in this work. Two evaluation criteria, conflict ratio and probability of missed critical alarm are formulated and are found to be independent of both traffic density and traffic model. These parameters depend only on system alarm thresholds, critical miss distances and relative position prediction uncertainty. This results in a simple method for system evaluation and examination of new anti-collision concepts. A closed-form method for estimating system alarm rate is also developed based on both a new traffic model and empirical data. Anti-collision systems are numerically compared by use of the criteria developed in this thesis. In the terminal area it is found that the conflict ratio ranges from about 900 for a simple PWI device to about 25 for a full state collision avoidance system. The difference in the en-route environment is found to be less severe. The design of a low conflict ratio collision avoidance system is also discussed in this thesis and both an algorithm and display are developed.

AIRCRAFT EMISSIONS SURVEY
DOT–TSC–OST–71–5
DOT/Transportation Systems Center
Accession No. PB-204794
Broderick, A.J., Harriott, W.F., Walter, R.A.

March 31, 1971
Air Pollution, Gas Turbines, Emissions, Jet Engines, Instrumentation.

This technical memorandum presents the preliminary results of a survey of transportation systems emissions monitoring requirements. Emissions of carbon monoxide, hydrocarbons, oxides of nitrogen and particulates from aircraft power plants, with emphasis on gas turbine engines, are considered. Measurement rationale for various types of aircraft is summarized. Instrumentation available for measuring these emissions is reviewed and a tabulation made of those techniques in current use. Instrumentation requiring further engineering development is briefly discussed.

A REVIEW OF AVAILABLE L-BAND AND VHF AIRCRAFT ANTENNAS FOR AN AIRCRAFT-SATELLITE COMMUNICATIONS LINK
DOT–TSC–OST–71–8
Transportation Systems Center
Accession No. PB-204799
The Telecommunications Division
93 p.
May 1971
L-Band Antenna, VHF Antenna, Slot-Dipole Antenna, Boeing.

One of the problems encountered in designing an aircraft to use a satellite system for communications (and for surveillance and navigation) is that of finding a suitable aircraft antenna. There is, at present, no antenna which will satisfy all requirements. The purpose of this paper is to briefly review the characteristics of some of the L-Band and VHF antennas which have been proposed for an aircraft-satellite link.

AN AIRPORT AIRSIDE SYSTEM MODEL
DOT–TSC–OST–71–12
Transportation Systems Center
Accession No. PB-204802
Englander, I.

June 1971

This model of an airport airside system simulates aircraft operations and controller functions in the terminal area, both in the air and on the ground. The model encompasses all operations between the terminal gate and the point of handoff between the enroute controller and the terminal controller.

CLIMATIC IMPACT ASSESSMENT PROGRAM, PROCEEDINGS OF THE SURVEY CONFERENCE, FEBRUARY 15-16, 1972
DOT–TSC–OST–72–13
Transportation Systems Center

Barrington, A.E.
281 p.
September 1972
Climatic Impacts, Engine Emissions, Stratosphere.

This volume contains the proceedings of a survey conference, held at the DOT Transportation Systems Center, which was the first of the reporting milestones of the Climatic Impact Assessment Program. CIAP, managed within the Office of the Secretary of Transportation, will assess, by report in 1974, the impact of climatic changes which might result from perturbation of the upper atmosphere by the exhaust effluent of a world high-altitude aircraft fleet, as projected to 1990.

The primary objective of this conference was to introduce the objectives and scope of CIAP to domestic and foreign representatives of industry, universities, and government agencies. Nineteen speakwere invited, at very short notice, to prepare informal introductory surveys in their respective disciplines which would be instructive to specialists in other areas and would illustrate the range of activities related to CIAP. These tutorials dealt with the general categories of engine emissions, the natural stratosphere, the physical and biological impact of stratospheric perturbations, and risk/benefit analysis. All but one of the talks are included in this volume, each followed by an abbreviated version of the ensuing open discussion.

AIRPORT AND AIR SERVICE ACCESS
DOT–TSC–OST–73–3
Civil Engineering Systems Laboratory

de Neufville, R., Wilson, N., Moore, H. III, Gelerman, W., Landau, U., Yaney, J.
156 p.
March 1973
Airport Access, Air Service Access, Satellite Airports, Air Networks.

The problems of airport and air service access are investigated in this report. Airport access, primarily an urban transportation system problem, is investigated using data obtained from the Cleveland-Hopkins Airport Access Study and other surveys and studies. The nature of airport access and of passenger behavior with regard to it is investigated to determine what governmental policies might be appropriate. Many of the factors that determine how passengers choose their access mode and, consequently, how they would use a new mode that might be provided cannot readily be affected by governmental action. Massive investment in access modes is not a cost-effective method of changing passenger flows to the airport; improvements in these modes should be of an operational nature.

Airport access is a subset of air service access; attention to problems of the latter may provide more chance to improve service for the air passenger. This study investigates two aspects of the air service access problem: air network configuration and the use of satellite airports. Using aggregate delay time as a measure of effectiveness, the most efficient network was found to be one in which traffic is concentrated, reducing network connectivity. However, tradeoffs between average quality of service & distributional effects must be considered in policy making. Satellite airports may seem to be a convenient means to improve access to air service in a region, but competitive economic forces discourage both airlines & air passengers from using satellite airports and impell them to concentrate at major terminals. Satellite or reliever fields will not be used significantly by air carriers without some form of governmental coercion.

PROCEEDINGS OF THE SECOND CONFERENCE ON THE CLIMATIC IMPACT ASSESSMENT PROGRAM
DOT–TSC–OST–73–4
DOT Transportation Systems Center

Broderick, A.J.
437 p.
April 1973
Ozone, Emissions, Stratosphere, SST's, Aerosols, Atmospheric Transport, Atmospheric Modeling, Atmospheric Dynamics, Chemical Kinetics, Ultraviolet Radiation, Photochemistry, NO_x, Climate, Sampling, Pollutants.

This volume contains the proceedings of the Second Conference on the Climatic Impact Assessment Program (CIAP), held at the DOT Transportation Systems Center on November 14-17, 1972. It includes 37 invited papers, four unscheduled presentations, three edited panel discussions, and edited question-and-answer sessions following some of the papers. The conference was essentially a progress report on CIAP. Therefore, some of the papers contain new data not yet published elsewhere, others detailed experiment plans or hardware for use in the near future, and a few deal with proposed investigations which may be directly relevant to CIAP. The subjects covered include aircraft-engine emissions, the nature of the "undisturbed" stratosphere of 1974, the nature of the "perturbed" stratosphere of 1990-2025, the possible resulting tropospheric perturbations, and the biological and economic effects of such perturbations.

A SUMMARY OF OPTIMIZATION TECHNIQUES THAT CAN BE APPLIED TO SUSPENSION SYSTEM DESIGN
DOT–TSC–OST–73–9
Arizona State University
Accession No. PB-220553
Hedrick, J.K.
44 p.
March 1973
Vehicle Suspension, Track Levitated Vehicles.

Summaries are presented of the analytic techniques available for three levitated vehicle suspension optimization problems: optimization of passive elements for fixed configuration; optimization of passive elements for fixed configuration; optimization of a free passive configuration; optimization of a free active configuration. The techniques are applied to a heave dynamic model which includes gravity forces, random aerodynamic forces and random guideways making use of penalty functions which include vehicle acceleration, suspension displacement, gap variation, power requirements.

INVESTIGATION OF JET NOISE USING OPTICAL HOLOGRAPHY
DOT–TSC–OST–73–11
Massachusetts Institute of Technology
Accession No. PB-214112
Salant, R.F.
60 p.
April 1973
Optical Holography, Supersonic Jet Noise, Mach Waves.

Holographic interferograms have been made of cold, laboratory scale, supersonic air and nitrogen jets in the mach number range of 2.1 to 3.4, and of helium jets in the mach number range of 1.5 to 2.95. These holograms demonstrate that the acoustic field in the vicinity of such jets is dominated by mach waves, each of which can be traced back to a generating disturbance within the jet. The mach waves are generated from an axial position slightly downstream of the nozzle exit to a position near the tip of the potential core. Measurements of mach angle indicate that the average convection velocity of the generating disturbances in the air/nitrogen jet is approximately 84% - 90% of the jet velocity for the mach number range of 2.1 - 2.7, and approximately 77% of the jet velocity for the mach number range of 2.8 —3.4. The average convection velocity of the generating disturbances in the helium jet is approximately 67% of the jet velocity. The disturbances appear to be coherent instabilities rather than turbulent eddies, and extend into the potential core. Accelerometer measurements of nozzle vibration suggest that the disturbances originate upstream of the nozzle.

PREDICTION OF V/STOL NOISE FOR APPLICATION TO COMMUNITY NOISE EXPOSURE
DOT–TSC–OST–73–19
United Aircraft Corp.
Accession No. PB-221146
Munch, C.L.
280 p.
May 1973
Noise Abatement Aviation Sources, V/STOL Noise, Community Noise Exposure.

A computer program to predict the Effective Perceived Noise Level (EPNL), the tone corrected Perceived Noise Level (PNLT), and the A-Weighted Sound Level (dBA) radiated by a V/STOL vehicle as it flies along a prescribed takeoff, landing, or cruise flight path is described in detail and a complete users guide for the program is presented. The procedures used to predict the noise radiated by helicopter rotors, propellers, turboshaft engines, lift and cruise fans, and jets are described in detail. Helicopter rotor noise and jet noise are theoretically predicted with some empirical modifications while propeller, fan, and turboshaft engine noise is calculated with primarily empirical procedures. The program is designed to be easy to use; thus it should be useful in V/STOL-port planning studies.

There are major limitations of current technology on the use of the program; the noise of VTOL vehicles characterized by impulsive type noise signatures should not be predicted and, because there are not yet adequate methods for predicting the noise from deflected jets, augmentor wings, blown flaps, and the like, noise of augmented lift STOL aircraft cannot yet be predicted. There is, in fact, some evidence to indicate that the EPNL measure does not adequately predict the annoyance of impulsive noise signatures and it is hoped that improved measures to account for the annoyance of impulsive noise will be developed in the near future.

COMPARATIVE STUDIES OF THE SUPERSONIC JET NOISE GENERATED BY RECTANGULAR AND AXISYMMETRIC NOZZLES
DOT–TSC–OST–73–22
Massachusetts Institute of Technology

Low, K.C., Louis, J.F.
118 p.
June 1973
Supersonic Jet Noise, Axisymmetric Nozzle, Rectangular Nozzle, Mach Wave, Turbulence Shock Interaction, Scaling Laws Of Supersonic Jet Noise.

The main purpose of this study is to develop experimental scaling laws useful for predicting the overall sound power of supersonic jets operating under a range of high stagnation temperatures and pressures and under various exit Mach numbers. A shock tube is used as a flexible tool to provide the range of high stagnation temperatures and pressures associated with the supersonic jets in this investigation. The range of stagnation pressures chosen (for a given temperature and Mach number) correspond to overexpanded, perfectly expanded, and underexpanded conditions of the jet. Two different nozzle configurations: a rectangular and an axisymmetric, are examined to determine how a basic difference in shape of the jet changes the relative importance of the different noise generating mechanisms. Measured sound directivity and Mach waves propagation direction obtained from shadowgraphs indicate that Mach waves contribute importantly to the noise produced by a rectangular jet. Similar measurements made on the axisymmetric jet indicate stronger influence of shock-induced noise and in particular of shock turbulence interaction. To guide the formulation of scaling laws for the prediction of overall sound power, a theoretical model is proposed which derives expressions for the power sound level associated with Mach waves and for shock turbulence interaction. Concurrent use of the model and of experimental data allow the formulation of scaling laws for the overall sound power. The quasi two-dimensional flow from the rectangular nozzle gave an opportunity to study Mach and nozzle lip waves for both low and high temperature jets.

TRANSPORTATION CONTRACTORS

MODELING OF V/STOL NOISE IN CITY STREETS
DOT–TSC–93–1
Massachusetts Institute of Technology
Accession No. PB-211953
Lyon, R.H., Pande, L., Kinney, W.A.
49 p.
November 15, 1971
Noise Levels, V/STOL Noise, Noise Propagation, Urban Noise Propagation.

The goals of this work were two-fold. First, to develop modeling techniques that will be helpful in studying a variety of noise propagation problems. These involve not only aircraft sources, but also surface traffic (automobiles, trucks, and rail vehicles) as well. The second and more narrow goal is the application of these modeling techniques to a specific problem, the propagation of V/STOL aircraft noise into an urban area.

Two particular flight-path-street-configuration situations were examined, using a 1:32 scale for the laboratory model. A steady-state aerodynamic noise source was used to simulate flyover noise. A second source for generating sound pulses was used for ray-tracing diagnoses.

The propagation effects of streets and buildings, which cause sound levels to differ from that in open flat terrain, are lumped together into a "Transmission Gain (TG)". A major part of the work reported here is the experimental evaluation of TG for various model configurations, flight paths, and microphone locations.

MARITIME SERVICES SATELLITE SYSTEM DEFINITION STUDY
DOT–TSC–98
Automated Marine International
Accession No. PB-204860
Mendoza, B.A., Lawson, D.C., Heckert, G.P., Luse, J.D.
388 p.
August 1, 1971
Maritime Mobile/Satellite Communications, Multiple Access/Ship Populations/Search And Rescue/Shipboard SATCOM Terminals/Maritime Satellite/Satellite And User Equipment.

This report reviews the requirements for voice and data communications to and from merchant ships at sea, for the period through 1980, and concludes that a global coverage satellite system of three synchronous satellites, each with a 10 voice-channel capacity, will meet forecast requirements provided that a disciplined demand access scheme is implemented. The present spacecraft technology is reviewed and certain critical spacecraft subsystem design criteria are assessed. The shipboard terminal is reviewed in detail, and the basic design constraints are established. The report concludes that an independent maritime satellite communications system is not only feasible with today's technology but inevitable, and that final definition and design of appropriate hardware should be undertaken at once.

ANALYSIS OF TERMINAL AIR TRAFFIC CONTROLLER FUNCTIONS
VOLUME I
VOLUME II: APPENDICES
DOT–TSC–103–71–1
Aerospace Systems, Inc.

Noll, R.B., Scully, J.J., Simpson, R.W., Zvara, J.
Vol. I - 77 p.
Vol. II - 175 p.
May 1971
Terminal Air Traffic Control, Air Traffic Controller Functions, Operational Sequence Diagrams, Advanced Generation Air Traffic Control, ARTS I.

Air traffic controller functions in the terminal area are described for both the second generation (present system) and third generation (ARTS) air traffic control (ATC) system. Logan International Airport, Boston, Massachusetts and Atlanta Airport, Atlanta, Georgia represent the second and third generations, respectively. Controller position functions are briefly described, and a detailed presentation of controller duties and responsibilities at each position is given for the selected ATC facilities.

Operational sequence narratives and diagrams are presented for typical single thread events at each facility. Real-life operational sequence diagrams are presented for each control position at Atlanta.

Areas of potential improvement in ATC are discussed briefly. Operational position profiles and operational sequence diagrams for an advanced system are derived from similar material for the third generation system. A Runway Schedule Display is proposed as a potential area of investigation.

Supplementary material is presented describing the alphanumeric display of ARTS I at Atlanta and the computer inputs by which the controller interfaces with ARTS I.

AIRSPACE CONTROL ENVIRONMENT SIMULATOR–FINAL REPORT
DOT–TSC–131–3
Raytheon Company

Benham, F., Hatch, A., Kass, S.
233 p.
December 22, 1971
Simulation, ATC Experiments.

The Airspace Control Environment Simulator is a software system designed to operate within a PDP-10 computer in conjunction with a DDP-516/ADDS-900 graphic display system. Its purpose is to provide the capability to conduct interactive experiments to explore the feasibility of new concepts for ATC automation. The simulation system design is described and operating procedures are provided for those who may wish to use the system. Complete program listings, principally in FORTRAN, are provided.

A SYSTEMATIC STUDY OF SUPERSONIC JET NOISE
DOT–TSC–142–1
Massachusetts Institute of Technology
Accession No. PB-211954
Louis, J.F.
64 p.
December 1971
Supersonic Jet Noise, Axisymmetric Nozzle, Turbulent Mixing, Rectangular Nozzle, Shock Unsteadiness, Mach Wave, Turbulence Shock Interaction.

The purpose of this work is to study the acoustic fields associated with two different nozzle configurations; a rectangular and a circular. Both nozzles are designed with the same exit Mach number and have an identical momentum and energy flux.

The other main aim of this study is to establish scaling laws of supersonic jet noise. A shock tube is a very versatile apparatus for such an analysis. A short test time allows the use of a heat sink nozzle and eliminates the use of an anechoic chamber. So far tests have been made in the range of 1000-5000°R, for different levels of expansion and an exit Mach number of 2.7. In comparing the two nozzles, it is found that the rectangular nozzle is indeed quieter than the circular nozzle. The low acoustic efficiency of the over-expanded rectangular jet is related to a rapid deceleration of the jet through a system of strong shocks. At high temperature, this effect is not observed because an important density ratio exists across the shear layer which becomes very unstable due to the Taylor instability.

For both the circular and rectangular nozzle, the effect of temperature showed an increase in the directivity angle at high temperature which is correlated to an increase in eddy convective velocity, rather than refraction due to density gradients, which seems to play a secondary role.

The low temperature overexpanded jet showed a difference of about 2.6 db in the OPWL between the two nozzles. However, at this condition, for the rectangular nozzle, a difference of 8 db between the maximum and minimum noise direction is observed.

A SCALE MODEL AIRCRAFT & ANTENNA PATTERN TEST PROGRAM
DOT–TSC–167–(6)
Diamond Antenna & Microwave Corp.

McCabe, W.J.
111 p.
November 15, 1971
Aircraft Antennas, Model Aircraft, Polarization, Antenna Coverage, Aerosat Sys, Aircraft Antenna Location.

This final report describes the program activity, coordinate systems, axes of rotation, and electromagnetic radiation patterns measured for flush mounted circularly polarized slot antennas installed in a 1/10th scale model of a Convair 880 aircraft. Pattern coverage was measured for five (5) locations of the antenna elements in the fuselage using a circularly polarized transmitting antenna. Polarization ratios were measured for a zenith pointing antenna over a 45° conical sector about the zenith direction $\theta = 0°$. The model aircraft construction and the antenna elements are also described. Punched paper binary coded tapes are attached as a separate package, and the tape punched hole schematic is described herein.

PWI TEST AND DEVELOPMENTAL RESOURCE UTILIZATION
DOT–TSC–188–1
Intermetrics, Incorporated
Accession No. PB-212495
Carlson, N.A., Grundy, P.A., Morth, H.R., Copps, E.M., Flanders, J.H.
228 p.
November 15, 1971
Electro-Optical PWI, Test Programs, Simulation Facilities, Evaluation Tools.

This report documents a study performed for TSC in support of its test and evaluation program for optical-infrared PWI systems, the primary objectives of the study being to assess the utility of existing test facilities and evaluation tools, and to identify the the need for modifications or additions to these. The major physical characteristics of the Fecker and Loral PWI systems are described, and an analytic model presented for the incident radiant power received by the PWI device, including atmospheric transmission effects. The laboratory, ground, and flight test programs for optical-IR PWI systems conducted by TSC and (earlier) NASA/ERC are examined, including the objectives, test equipment and procedures, data analysis, and results of each. The utility of cockpit simulation facilities is assessed, in particular the TSC and MIT GAT-1's and the CDC slide projection system sponsored by FAA. The CASTE digital

computer program for simulating PWI performance in selected air traffic environments is evaluated and modifications suggested. The results of a survey of PWI-related research are discussed and areas for further work noted. Finally, a status summary of the available PWI facilities and tools is provided, and the major conclusions and recommendations of the study presented.

PWI SYSTEMS SURVEY
DOT–TSC–188–2
Intermetrics Incorporated
Accession No. PB-212496
Flanders, J.H., Grundy, P.A., Carlson, N.A.
156 p.
November 15, 1971
Pilot Warning Indicators, Collision Avoidance Systems, Annotated Bibliography, Literature Survey.

This survey report presents a compilation, classification, and review of 176 documents related to PWI and CAS research and development. The selection of documents emphasizes those published from 1968 to the present, although earlier significant documents are included. Subject categories include: CAS System References; PWI System References; Proceedings and Literature Searches; Facilities and Programs; and Atmospheric Physics. A multi-dimensional classification code for CAS and PWI systems is developed and applied to candidate systems revealed during the survey. Written reviews of documents vary from a few lines to 2 or 3 pages, and are grouped according to subject.

FUNCTIONAL ERROR ANALYSIS AND MODELING FOR ATC SYSTEM CONCEPTS EVALUATION
DOT–TSC–212–72–1
Aerospace Systems, Inc.

Hoffman, W.C., Hollister, W.M., Simpson, R.W.
98 p.
May 1972
Air Traffic Control, Error Analysis, Error Models, Simulation, Target Dynamics, Air Data System, Navigation Systems, Surveillance Systems.

A functional error analysis and modeling study of the air traffic control (ATC) system is described. The work was performed to support the ATC system concepts evaluation program of the Transportation Systems Center (TSC), which will be conducted on their Multi-Modal Transportation System Simulation. The dominant functional error sources in the ATC system are identified and models of these errors are developed for implementation in the TSC simulation. The models are constructed to be as realistic as possible without placing excessive computational requirements on their realization. The models were developed in four categories: target dynamics, air data system, navigation systems and surveillance systems. The simulation wind model was also improved. The performance of the altitude, airspeed and heading command loops in the target dynamics model were numerically verified by digital computer simulation.

HIGH LEVEL DATA COMMUNICATION CONTROL PROCEDURES FOR AIR TRAFFIC CONTROL, COMPUTER-TO-COMPUTER DATA INTERCHANGE
DOT–TSC–235
Honeywell, Inc.

Huettner, R.E., Tymann, E.B.
56 p.
September 1971
Air Traffic Control, Control Procedures, Data Communication, Data Interchange.

This document defines link communication control procedures for ATC computer-to-computer data interchange, via point-to-point, full duplex communication links. These ATC control procedures have been developed to satisfy all requirements of the ATC computer data link environment, as established by ICAO ADIS Panel Working Groups 1 and 2.

These ATC control procedures are based on ISO draft proposal HDLC bit-oriented control procedures, but are not totally consistent with HDLC for reasons outlined in this document. The concept of balanced system operation is introduced as a basis for applying bit-oriented control procedures to the ATC system.

This document includes a complete definition of all required control procedure elements and also illustrates data transfer examples using ATC control procedures.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY–SUMMARY
DOT–TSC–304–1
Autonetics
Accession No. PB-212174
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

A study and analysis was conducted to extend the work of the Air Traffic Control Advisory Committee in defining a Fourth Generation Air Traffic Control System capable of safe and economical management of CONUS and oceanic air traffic in the post 1990 time period. The analysis considered several candidate systems capable of managing air traffic over a wide variety of operational conditions. The relative advantages and disadvantages of each were identified and compared with the Upgraded Third Generation Air Traffic Control System. Technology requirements for the new concepts were identified and a development plan established.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY–VOLUME II
DOT–TSC–304–1
Autonetics
Accession No. PB-212175
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

A study and analysis was conducted to extend the work of the Air Traffic Control Advisory Committee in defining a Fourth Generation Air Traffic Control

System capable of safe and economical management of CONUS and oceanic air traffic in the post 1990 time period. The analysis considered several candidate systems capable of managing air traffic over a wide variety of operational conditions. The relative advantages and disadvantages of each were identified and compared with the Upgraded Third Generation Air Traffic Control System. Technology requirements for the new concepts were identified and a development plan established.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY—VOLUME III
DOT—TSC—304—1
Autonetics
Accession No. PB-212176
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

A study and analysis was conducted to extend the work of the Air Traffic Control Advisory Committee in defining a Fourth Generation Air Traffic Control System capable of safe and economical management of CONUS and oceanic air traffic in the post 1990 time period. The analysis considered several candidate systems capable of managing air traffic over a wide variety of operational conditions. The relative advantages and disadvantages of each were identified and compared with the Upgraded Third Generation Air Traffic Control System. Technology requirements for the new concepts were identified and a development plan established.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY—VOLUME IV
DOT—TSC—304
Autonetics
Accession No. PB-212177
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

A study and analysis was conducted to extend the work of the Air Traffic Control Advisory Committee in defining a Fourth Generation Air Traffic Control System capable of safe and economical management of CONUS and oceanic air traffic in the post 1990 time period. The analysis considered several candidate systems capable of managing air traffic over a wide variety of operational conditions. The relative advantages and disadvantages of each were identified and compared with the Upgraded Third Generation Air Traffic Control System. Technology requirements for the new concepts were identified and a development plan established.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME I—STUDY REPORT
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212178

April 1972
Air Traffic Control, ATC, Future ATC System, Fourth-Generation ATC System, Air Transportation, Passenger Demand, Communications, Data Acquisition, Data Processing, Navigation, Guidance, Airports, Aircraft.

The operational concept, projected passenger demand, ATC system performance tradeoff data, and subsystem technological alternatives were evaluated to select the two most promising candidate systems for a fourth-generation (1995) ATC system. These two candidates and the upgraded third-generation system were then compared and a final recommended fourth-generation ATC system selected. The recommended system was described as to technology, operation, implementation plan, and required research and development.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME II—TECHNOLOGICAL ALTERNATIVES
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212179

April 1972
Air Traffic Control, Air Navigation, Aircraft Surveillance, Communications, Data Link, Satellite Systems, Aircraft Guidance, Automatic Landing, Data Processing, Display Devices.

This document presents the results of studies of alternative subsystem approaches applicable to the Fourth Generation Air Traffic Control System. Equipment currently in operation, that planned for near future implementation and various techniques proposed as possible future solutions to ATC requirements are included. Numerous ground-based and satellite-borne systems are discussed for providing the required navigation, surveillance, and communications functions. In addition the ground-based data processing and control equipment along with the required airborne equipment are treated.

These subsystem alternatives have been evaluated to provide a meaningful measure of their merits and where appropriate, future performance improvement levels have been postulated. This information forms the data base from which candidate ATC systems were selected as described in Volume IV - System Selection.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME III—DEMAND AND TRADE STUDIES
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212180

Air Traffic Control, ATC Performance Trade Studies, Airport Operations Analysis, Runway Acceptance Rates, Queuing Analysis, Airplane Traffic Projections, Computer Modeling.

Techniques and resulting data are developed in the areas of demand, data acquisition, traffic management, and communications. Each area is subdivided to reflect the geographical region of operation as oceanic, domestic route, terminal area, and airport.

2

ATC performance tradeoff information is developed parametrically to encompass a wide range of possibilities for the 1995 time period.

Data are presented for STOL, CTOL, and SST/CTOL airplane mix configurations. Separation criteria to meet potential demands, resulting impact on safety, and required improvements for surveillance, navigation, procedure, and communications are included. The effect of airport and runway splits are discussed and parallel runway separation requirements are analyzed. Various mixes of voice and digital communications are considered. Principal computer models used in this study are discussed.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME IV–SYSTEM SELECTION
DOT–TSC–306–1
The Boeing Company
Accession No. PB-212181

Air Traffic Control, System Synthesis, Evaluation Model, Implementation Plan, Cost Estimation, Weighting Functions.

This volume describes the methodology used in selecting a fourth generation Air Traffic Control System consistent with U.S. air transportation needs in 1995, and provides a summary of the results. It includes the derivation and use of the computerized evaluation model, including the computer program for its implementation; the cost model and supporting cost data; implementation plans; the initial and final system selection processes and results; and recommendations for further study.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME V–RECOMMENDED RESEARCH AND DEVELOPMENT
DOT–TSC–306–1
The Boeing Company
Accession No. PB-212182

170 p.
April 1972
Air Traffic Control, ATC, Future ATC System, Fourth-Generation ATC System, Air Transportation, Passenger Demand, Communications, Data Acquisition, Data Processing, Navigation, Guidance, Airports, Aircraft.

Research and development needed to support the fourth-generation ATC system implementation is described in this volume. A methodology and program plan for operational concept evaluation, a requirements plan for a surface guidance system, and a testing and evaluation schedule for subsystem technical feasibility are described. The impact of future developments on subsystem changes and overall system characteristics is described. Finally, the time phasing of system implementation is also discussed together with the basic criteria used in ATC implementation planning.

2. AGRICULTURE

NO REPORTS

3

3. ASTRONOMY AND ASTROPHYSICS

Includes the following Groups: Astronomy; Astrophysics; Celestial Mechanics.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D C 20590

MEASUREMENTS OF TRANSATMOSPHERIC ATTENUATION STATISTICS AT THE MICROWAVE FREQUENCIES: 15, 19 AND 34 GHZ.
DOT–TSC–NASA–71–13
Transportation Systems Center

Haroules, G.G., Brown, W.E. III, Bishop, G.J.

42 p.
June 1971
Earth-to-Space Paths, Electromagnetic Wave Propagation, Atmospheric Attenuation.

Attenuation statistics resulting from a twelve month observation program are presented. The sun is used as a source of microwave radiation. The dynamic range of atmospheric attenuation measure. ment capability is in excess of 30 dB. Solar radiation characteristics with amplitude variations of a few percent are easily measured, while at the same time provision is made to accommodate a 10 dB range above the quiet sun level if major solar flare activity occurs. The solar phenomenon was extracted from the data since it is not an objective of the measurement program. A discussion and analysis of the measurement technique is presented in support of the experimental data.

4

4. ATMOSPHERIC SCIENCES

Includes the following Groups: Atmospheric Physics; Meterology.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

SURVEY OF METEOROLOGICAL REMOTE SENSORS
DOT–TSC–CG–71–1
Transportation Systems Center
Accession No. PB-204793
Barrington, A.E.

May 1971
Meteorology, Remote Sensing, Data Buoy, Instrumentation.

The preliminary results of a survey are presented which identify techniques for determining meteorological data by remote sensing, applicable to automatic data buoy platforms. Both passive and active techniques are reviewed with emphasis on the former, in view of their more advanced development status. The principal references listed in the bibliography section of the memorandum indicate that experimental data to date have been obtained using only stable instrument platforms in a clean environment. Operation on unstable instrument platforms in the severe ocean environment requires further study.

USCG POLLUTION ABATEMENT PROGRAM: A PRELIMINARY STUDY OF VESSEL AND BOAT EXHAUST EMISSIONS
DOT–TSC–USCG–72–3
Transportation Systems Center
Accession No. PB-210417
Walter, R.A., Broderick, A.J., Sturm, J.C., Klaubert, E.C.
129 p.
November 30, 1971
Vessel And Boat Emissions, Marine Air Pollution, Coast Guard Fleet Emissions, Air Quality.

A preliminary study of exhaust emissions from Coast Guard vessels and boats indicates that the Coast Guard fleet is an insignificant contributor to air pollution on a national and regional basis. Based upon fuel usage data, emission estimates by vessel class were made for the entire Coast Guard fleet and compared to other sources of marine and land air pollution. No estimates of the effects on air quality of the two-stroke cycle outboard engine could be made due to the lack of reliable data on their emissions.

A general review of the existing air quality legislation pointed up the scarcity and contradictory nature of present laws as related to vessel emissions.

Existing monitoring instrumentation and emission control techniques were evaluated with consideration to their usefulness in a ship-board environment.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

AIRCRAFT WAKE VORTEX SENSING SYSTEMS
DOT–TSC–FAA–72–13
Transportation Systems Center
Accession No. AD744864
Burnham, D., Gorstein, M., Hallock, J., Kodis, R., McWilliams, I., Sullivan, T.
65 p.
June 30, 1971
Vortec, Acoustic, Sensor.

For primary bibliographic entry, see Field 1.

CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM
DOT–TSC–FAA–72–38
Transportation Systems Center
Accession No. AD757074
Wagner, G.W., Haroules, G.G., Brown, W.E.
94 p.
February 1973
Clear Air Turbulence Radiometer.

For primary bibliographic entry, see Field 1.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D C 20590

ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 KHZ (100 KM) - 3,000 THZ (0.1 μM)
DOT–TSC–NASA–71–6
Transportation Systems Center
Accession No. N71-20121
Thompson, W.I. III
300 p.
February 1971
Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, Ultraviolet.

This handbook presents material on electromagnetic wave transmission in the earth's atmosphere with emphasis on earth-to-space paths up to January 1970. This type of information is needed in such varied fields as air pollution, astronomy, communications, earth resources, geodesy, meterology, and navigation.

Part I presents basic background information dealing with transmission fundamentals, the properties of electromagnetic waves, the electromagnetic spectrum, and the earth's atmosphere.

Part II is a guide to information on the transmission properties of the earth's atmosphere to electromagnetic radiation. A major feature of Part II is the listing of tables of contents of several books and major articles on atmospheric transmission.

Part III contains selected transmission information on the following observable quantities: refraction, absorption, and scattering.

Part IV is a bibliography to be published in a separate volume entitled Atmospheric Transmission Bibliography 1960-1969: A KWIC Index of Electromagnetic Wave Transmission in the Earth's Atmosphere Over the Frequency (Wavelength) Range 3 kHz (100 km) - 3,000 THz (0.1 μm). The bibliography covers the frequency regions: radio, microwave, infrared, visible, and ultraviolet. There is a listing of citations by local accession number, a key-word-in-context (KWIC) index or permuted title index, and an author index.

OPTICAL COMMUNICATIONS & DETECTION SYSTEM
DOT–TSC–NASA–71–12
Transportation Systems Center

Buck, R.E., Gagnon, R., Jordan, L.M., Karp, S.
101 p.
August 1971
Laser Pulse Broadening, Earths Atmosphere, 1.06 Micron, Scintillation, Fog, Clear Air.

The two milestones of the program (1) development of a high quantum efficiency 1.06 micron photoemissive surface and (2) narrow pulse propagation in the earth's atmosphere at 0.63 microns were completed.

Item 1 was completed in a contract award.

Item 2 was complete to the extent permitted by the weather conditions in that only two foggy days were encountered during the three month period.

The clear air measurements indicated that: pulse broadening in the atmosphere is less than 20 picoseconds or a coherence bandwidth in excess of 50 GHz; aperture averaging appears to progress with the square of the collector diameter for large diameters; statistics of aperture averaged signals remain log normal.

The measurements from one foggy day indicate: no pulse broadening was observed in fogs with ¼ mile visibility although a 20 dB loss was encountered; no return from multiple scattering could be observed to a 4 degree field of view with a 20 dB dynamic range in the detector; no Doppler broadening greater than 1 KHz was observed with optical thickness as high as 4.

MEASUREMENTS OF TRANSATMOSPHERIC ATTENUATION STATISTICS AT THE MICROWAVE FREQUENCIES: 15, 19 AND 34 GHZ.
DOT–TSC–NASA–71–13
Transportation Systems Center

Haroules, G.G., Brown, W.E. III, Bishop, G.J.
42 p.
June 1971
Earth-to-Space Paths, Electromagnetic Wave Propagation, Atmospheric Attenuation.

For primary bibliographic entry, see Field 3.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, DC 20590

*** SURVEY OF INSTRUMENTATION FOR THE MEASUREMENT OF STRATOSPHERIC TRACE GASES AND PARTICULATES (CIAP)**
DOT–TSC–OST–72–4
Transportation Systems Center

O'Brien, A.E.
25 p.
November 1971
Instrumentation, Stratosphere, Trace Gases, Particulates.

During the period 1 September to 1 November 1971, a survey was conducted for the CIAP Program Office to determine the applicability of presently available instrumentation to the direct and/or remote measure of trace gases and particulates within the stratosphere. Consideration was also given to technique under development where near term applicability could be anticipated. Manufacturers and researchers were queried as to their capability. Details of responses were sifted and, when possible, were tabulated to present the pertinent facts on the performance, electrical, mechanical, environmental and cost factors for instruments which can be considered applicable, either directly or with some modification.

CLIMATIC IMPACT ASSESSMENT PROGRAM, PROCEEDINGS OF THE SURVEY CONFERENCE, FEBRUARY 15-16, 1972
DOT–TSC–OST–72–13
Transportation Systems Center

Barrington, A.E.
281 p.
September 1972
Climatic Impacts, Engine Emissions, Stratosphere.

For primary bibliographic entry, see Field 1.

EXPERIMENTAL PLAN FOR CONDUCTING IONOSPHERIC SCINTILLATION MEASUREMENTS USING ATS GEOSTATIONARY SATELLITES AT 136 AND 1550 MHZ
DOT–TSC–OST–72–33
Transportation Systems Center
Accession No. PB-220564
Brown, W.E. III, Haroules, G.G., Thompson, W.I. III
138 p.
April 1973
Ionospheric Scintillation, AEROSAT, Geostationary Satellites, Coherent Modulation, ATS.

An experimental plan for conducting ionospheric scintillation measurements using the geostationary Applications Technology Satellites at 136 MHz and 1550 MHz is presented. A remote unmanned data collection platform is proposed together with detailed design configurations and data collection and analysis procedures. The data collection platform provides a real time readout capability utilizing the ATS-1 or the ATS-3 satellites as a convenient radio relay link. A comprehensive literature search and bibliography are presented in support of the analysis which lead to the design of the remote data collection platform.

PROCEEDINGS OF THE SECOND CONFERENCE ON THE CLIMATIC IMPACT ASSESSMENT PROGRAM
DOT–TSC–OST–73–4
DOT Transportation Systems Center

Broderick, A.J.
437 p.
April 1973
Ozone, Emissions, Stratosphere, SST's, Aerosols, Atmospheric Transport, Atmospheric Modeling, Atmospheric Dynamics, Chemical Kinetics, Ultraviolet Radiation, Photochemistry, NO_x, Climate, Sampling, Pollutants.

For primary bibliographic entry, see Field 1.

STUDY OF THE PERFORMANCE REQUIREMENTS OF A VORTEX MONITORING SYSTEM–FINAL REPORT
DOT–TSC–141–1
Raytheon Company

Goff, R.W.
133 p.
March 1972
Vortex, Meterology.

This study involved four basic task items. The first was a general review of the characteristics of trailing vortex wakes. The second task item involved the generation of envelopes showing the expected vortex drift for the Boeing 747 and 727 aircraft. The third task item was an investigation of the environmental factors with which a vortex monitoring system would interact. The final task item was the application of the vortex drift data and operational usuage considerations to the investigation of the performance requirements for a vortex monitoring system.

SURVEY OF STRATOSPHERIC CHEMICAL DYNAMICS
DOT–TSC–369–1
Pressman Enterprises
Accession No. PB-213126
Pressman, J.
83 p.
April 23, 1972
Stratosphere, Pollution, SST, Stratospheric Aircraft, Stratospheric Chemical Dynamics, Ozone.

A survey and critical evaluation of information pertaining to the natural stratospheric composition and chemical dynamics and to the perturbations that might be induced by the exhaust emissions of aircraft flying in the stratosphere.

PROBLEM AREAS OF STRATOSPHERIC CHEMICAL DYNAMICS
DOT–TSC–369–2
Pressman Enterprises
Accession No. PB-213111
Pressman, J.
56 p.
June 1, 1972
Stratosphere, Pollution, SST, Stratospheric Aircraft, Stratospheric Chemical Dynamics, Ozone.

A report on recommendations identifying areas for further necessary study of natural stratospheric dynamics and the perturbations that might be induced by the exhaust emissions of aircraft flying in the stratosphere.

SURVEY OF STRATOSPHERIC AIRCRAFT WAKE CHEMICAL DYNAMICS
DOT–TSC–369–3
Pressman Enterprises
Accession No. PB-213114
Pressman, J.
56 p.
July 23, 1972
Stratosphere, Pollution, SST, Wake, Stratospheric Aircraft Ozone, Airplane Exhaust.

A survey and critical evaluation of information pertaining to the stratospheric aircraft wake chemical dynamics including both the hydrodynamics and chemistry of the phenomenon.

5

5. BEHAVIORAL AND SOCIAL SCIENCES

Includes the following Groups: Administration and Management, Documentation and Information Technology; Economics; History, Law, and Political Science; Human Factors Engineering; Humanities; Linguistics; Man-machine Relations; Personnel Selection, Training, and Evaluation; Psychology (Individual and Group Behavior); Sociology.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

*** HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**
DOT–TSC–FAA–71–2
Transportation Systems Center

Hilborn, E.H.
18 p.
January 1971
Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, Display Problems.

For primary bibliographic entry, see Field 1.

ALL-WEATHER-LANDING OPERATIONS BIBLIOGRAPHY
DOT–TSC–FAA–72–19
Transportation Systems Center
Accession No. AD754267
Morris, J.M.
52 p.
June 1972
Landing, All-Weather Landing, Category III Operations, Low-Visibility.

For primary bibliographic entry, see Field 1.

HUMAN FACTORS EXPERIMENTS FOR DATA LINK: INTERIM REPORT I
DOT–TSC–FAA–72–37
Transportation Systems Center
Accession No. AD754273
Hilborn, E.H.
72 p.
November 1972
Air Traffic Control, Data Link, Displays, Synthetic Speech, Message Coding, Simulators.

For primary bibliographic entry, see Field 1.

HUMAN FACTORS EXPERIMENTS FOR DATA LINK INTERIM REPORT NO. 2
DOT–TSC–FAA–73–6
Transportation Systems Center
Accession No. AD-760401
Hilborn, E.H., Devanna, L.R.
46 p.
April 1973
Air Traffic Control, Data Link, Message Coding.

For primary bibliographic entry, see Field 1.

OFFICE OF THE SECRETARY OF TRANSPORTATION
WASHINGTON, D C 20590

VEHICULAR TRAFFIC FLOW THEORY AND TUNNEL TRAFFIC FLOW MEASUREMENTS
DOT–TSC–OST–71–7
Transportation Systems Center
Accession No. PB-204798
Chin, G., Jordan, L., Kahn, D., Morin, S., Yoh, P.
221 p.
June 1971
Traffic Flow, Tunnel Traffic, Congestion, Airport Access.

Vehicular traffic flow has been investigated theoretically and experimentally in order that peak hour collective traffic flow dynamics be understood and that the peak hour flow through the Callahan Tunnel be improved by means of traffic flow control and modification. Two theoretical models are suggested, the finite reaction time model and the asymetrical response model, as predictive of observed traffic density dynamics, wave growth and asymetry. Experimentally, a traffic flow profile of capacities, vehicle speeds and traffic densities in the Callahan Tunnel has been obtained, and relationships between slowdown wave phenomena and traffic flow, determined. Based on these, it is suggested that traffic flow may be improved with traffic flow modification procedures.

MODELING TRANSPORTATION SYSTEMS: AN OVERVIEW
DOT–TSC–OST–71–9
Transportation Systems Center
Accession No. PB-213123
Kovatch, G., Zames, G.

June 1971
Transportation Modeling, Transportation Planning.

The purpose of this report is to outline the role of systems analysis and mathematical modeling in the planning of transportation systems. The planning process is divided into three sectors (demand, supply, and policy) reflecting the demand for transportation services by the public, the ability of the system to deliver these services, and the effects of management policies on the equilibriation between supply and demand. The composition of each sector is examined and illustrated by samples from recent major transportation studies and the modeling literature. Emphasis is placed on structure, dynamics, and feedback effects.

PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST ANALYSIS
DOT–TSC–OST–71–11
Transportation Systems Center
Accession No. PB-204801
Kovatch, G., Zames, G.

August 1, 1971
Transportation Systems Analysis, PRT Systems, Urban Transportation.

In this report a preliminary systems analysis of the Personalized Rapid Transit System concept is given. It includes presentation of the significant advantages and disadvantages of the concept. Questions of system capacity, station capacity, urban grid design, and headway requirements are addressed. A review of current manufacturers' concepts is given with a functional classification of their major characteristics. Major component and system needs, which require further research and analysis, are described. A brief discussion of cost factors is also given.

DESIGN AND CONSTRUCTION OF A PORTABLE OCULOMETER FOR USE IN TRANSPORTATION ORIENTED HUMAN FACTORS STUDIES
DOT–TSC–OST–71–13
DOT/TSC
Accession No. PB-213215
Davis, P.W., Lutz, J., Warner, A., Iannini, A.
38 p.
August 1971
Visual Performance, Eye-Motion Instrumentation, Pupilometry.

This report describes development of an instrument designed to acquire and process information about human visual performance. The instrument has the following features: (1) It can be operated in a variety of transportation environments including simulators, cars, trucks, trains, and air traffic control stations; (2) The visual performance measurements are made without alteration of the subject's normal visual behavior; and (3) The data can be presented to the experimenter as either a video picture of the scene with the fixation point superimposed, or as derived eye-motion parameters.

6

REPORTS BIBLIOGRAPHY, OCTOBER 1971 TSC, U.S. DEPARTMENT OF TRANSPORTATION
DOT–TSC–OST–71–17
Transportation Systems Center
Accession No. PB-204803
Waters, A.L.
17 p.
October 1971

This Reports Bibliography published at the Transportation Systems Center provides a substantive listing of Scientific Technical Reports published from July 1970 through October 1971.

Reports are arranged in 22 subject fields and are listed by Sponsoring Agency Name and Address. Abstracts of each Technical Report are presented providing a brief overview of substantive information in each report. The abstracts are cross referenced by COSATI field and subject title.

* **AN ANALYSIS OF AIRPORT ACCESS–A METHODS REVIEW AND RESEARCH PROGRAM**
DOT–TSC–OST–71–18
Systems Concepts Directorate

Paules, G.E., Roberts, E., Schaeffer, K.H.
244 p.
October 1971
Airport Access, Modal Split, Travel Survey Demonstrations.

The report points up the differences and similarities between airport access travel and general urban trip making. Models and surveys developed for, or applicable, to airport access planning are reviewed. A research program is proposed which would generate a standard airport technical planning package and establish a federal airport access planning assistance program to help local agencies in planning airport access demonstrations and improvements.

***TRANSPORTATION ANALYSIS AND SIMULATION FACILITIES (TASF) PLANNING AND APPROACH**
DOT–TSC–OST–72–6
Transportation Systems Center

Miller, H.G., TASF Program Office
104 p.
January 1972

The Transportation Analysis and Simulation Facility (TASF) will be a powerful tool which will greatly enhance the Transportation Systems Center's (TSC) capability to resolve large scale, complex transportation problems. TASF will allow multi-discipline systematic analysis of proposed single and multi-faceted overview of the technical, environmental, social-economic and land use consequences of proposed solutions to transportation planners. Utilization of TASF will allow development of systematic multi-disciplinary and qualitative costs and benefits associated with the various approaches to a balanced national transportation system.

* **REPORTS BIBLIOGRAPHY DECEMBER 1972 TSC, U.S. DEPARTMENT OF TRANSPORTATION**
DOT–TSC–OST–72–34
Transportation Systems Center

Waters, A.L.

December 1972

This Reports Bibliography published at the Transportation System Center provides a substantive listing of Technical Reports published from July 1970 through December 1972.

Bibliography lists reports available through the National Technical Information Service and those reports published for internal government use. Technical documentation pages of each report are included with listings of Unlimited and Limited distribution reports by Operating Administration. Report abstracts are presented on report documentation pages providing a brief overview of the substantive information in each report.

THE TRANSPORTATION SYSTEMS CENTER–A SPECIAL BRIEFING
DOT–TSC–OST–73–31
Transportation Systems Center

Dunlap, W.C.
130 p.
February 1973
Transportation, Research And Development, Ground, Urban, Local, Security, Safety, Water, Air, Technology, Procurement.

The publication is an edited record of the 1-1/2 day proceedings, and a repository of information about how the Transportation Systems Center functions, its role in society, its staff capabilities, and its programs in transportation for fiscal years 1971, 1972, and 1973. Additionally, the center's procurement procedures and its financial picture are stressed.

6. BIOLOGICAL AND MEDICAL SCIENCES

Includes the following Groups: Biochemistry; Bioengineering; Biology; Bionics; Clinical Medicine; Environmental Biology; Escape, Rescue, and Survival; Food, Hygiene and Sanitation; Industrial (Occupational) Medicine; Life Support; Medical and Hospital Equipment; Microbiology; Personnel Selection and Maintenance (Medical); Pharmacology; Physiology; Protective Equipment; Radiobiology; Stress Physiology; Toxicology; Weapon Effects.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, DC 20590

ELECTROCARDIOGRAM SCANNER-SYSTEM REQUIREMENTS
DOT–TSC–FAA–72–33
DOT/Transportation Systems Center
Accession No. AD-759082
Davis, P.W., Ofsevit, D., Lutz, J.
40 p.
March 1973
Electrocardiograms, Electrocardiography Scanning, Optical Scanners.

An experimental and analytical study has been conducted to establish the feasibility for scanning and digitizing electrocardiogram records. The technical requirements and relative costs for two systems are discussed herein. One is designed to automate the analysis of current electrocardiograms submitted in accordance with the FAA Aeromedical certification regulations. The other is designed for retrieval and scanning of the FAA file of microfilmed electrocardiogram records.

A cost-benefit analysis of the two systems is also presented.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

***DIESEL LOCOMOTIVE EXHAUST EMISSION CONTROL AND ABATEMENT**
DOT–TSC–FRA–72–6
Transportation Systems Center

Hergenrother, K.M.
18 p.
June 1972
Diesel Locomotive, Exhaust Emissions, Air Pollution.

Exhaust emissions from diesel locomotives are a product of engine design and combustion characteristics. These pollutants, control methods, and emissions reduction through engine maintenance and retrofittable equipment changes are discussed in this report.

***RAILROADS AND AIR POLLUTION: A PERSPECTIVE**
DOT–TSC–FRA–72–14
Transportation Systems Center

Sturm, J.C.
104 p.
May 1973
Railroads, Air Pollution, Emission, Diesel-Electric Locomotive.

A review of existing air pollution control legislation is presented with emphasis on legislation affecting the rail industry. Locomotive exhaust emissions, especially smoke, are receiving the bulk of attention from control agencies and the general public. Railroad emissions and emission sources are identified. Railroad exhaust emissions are estimated for the nation and for a region (St. Louis, MO). Transportation modes are compared for fuel consumption per unit work performed and for the emissions associated with consuming that fuel.

Recommendations include the environmental impact analysis of diesel-electric locomotive exhaust emissions on the air quality of St. Louis, MO, and the comparison of transportation modes based on emissions per unit work performed, grams pollutant emitted per 1000 ton-mile freight moved for line haul and grams pollutant emitted per 1000 -ton freight throughput for terminals.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
WASHINGTON, D C 20591

MEASUREMENT OF VEHICLE CONTAMINATION BY EXHAUST GASES
DOT–TSC–NHTSA–71–7
Transportation Systems Center
Accession No. PB-213481
Mathews, S.M.
74 p.
October 1, 1971
Automobile Safety, Carbon Monoxide, Exhaust Contamination Of Passenger Compartment.

An investigation of the concentration of carbon monoxide (CO) within the passenger compartment of motor vehicles has been made. A sample handling system has been developed to measure the concentrations of CO at as many as six locations inside and outside of a motor vehicle. To use this system effectively, a test procedure was developed with sixteen possible configurations of window, vent, and trunk lid openings. The sample system and test procedures were used on six different vehicles which represented several aerodynamic shapes and utilized different design features and auxiliary equipment. Data obtained in situations of low traffic density are presented.

EVALUATION OF LENGTH-OF-STAIN GAS INDICATOR TUBES FOR MEASURING CARBON MONOXIDE IN AIR
DOT–TSC–NHTSA–71–8
Transportation Systems Center
Accession No. PB-213437
Klaubert, E.C., Sturm, J.C.
15 p.
November 1971
Carbon Monoxide, Gas Analysis, Gas Indicator Tubes.

Techniques for measurement of carbon monoxide (CO) in air are of utility in many aspects of automobile safety. Concentrations ranging from less than 0.01 to about 10 percent CO are of interest. Gas indicator tubes for carbon monoxide (CO) were considered to be potentially useful for this application.

An empirical study was conducted to determine the degree of precision obtained from these tubes. A breadboard model of a semi-automated analyzer was constructed. The coiled tube sample reservoir permitted gas transport by following purge air with little mixing or dilution. One brand and type of indicator tube was evaluated at several different CO concentrations, gas flow rates, and at two different sample volumes. All tests were conducted at room temperature. The averaged values for ten tests at each experimental condition were found to fit very well to power-curve equations of the type predicted by theoretical analysis. The standard deviations for each group of tests indicated that any single measurement might differ from the true value by ±30 per cent.

OCCUPANT MOTION SENSORS: ROTATIONAL ACCELEROMETER DEVELOPMENT
DOT–TSC–NHTSA–72–1
Transportation Systems Center
Accession No. PB-212435
Warner, A., Ofsevit, D., Plank, G.
35 p.
April 1972
Acceleration, Accelerometer, Angular, Mouthpiece, Occupant Motion, Restraint System.

A miniature mouthpiece rotational accelerometer has been developed to measure the angular acceleration of a head during vehicle crash or impact conditions. The device has been tested in the laboratory using a shake table and in the field using dummies and humans. The results of the testing show that while the accelerometer is sensitive to angular acceleration it is also sensitive to linear acceleration, and in practical applications a correction factor for linear accelerations must be applied to the rotational output.

INSTRUMENTATION DEVELOPMENT FOR DRUG DETECTION ON THE BREATH
DOT–TSC–NHTSA–72–9
Transportation Systems Center

Hobbs, J.R., Barrington, A.E.
38 p.
September 1972
Mass Spectrometry, Breath Analysis, Drug Signatures.

Based on a survey of candidate analytical methods, mass spectrometry was identified as a promising technique for drug detection on the breath. To demonstrate its capabilities, an existing laboratory mass spectrometer was modified by the addition of a membrane separator and a field-ionization source.

Fourteen drugs were selected for investigation and it was possible to identify the signatures (mass spectra) of ten of these drugs with the modified instrument. Some drugs have been detected by direct sniffing, others first had to be dissolved in a suitable solvent and evaporated. The mass spectra presented in the report indicate the basic simplicity of field ionization as compared with ionization by the conventional method of electron impact. The report concludes with a description of the ease and rapidity of the new technique for clinical analysis.

LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOLUME I–SUMMARY REPORT
DOT–TSC–NHTSA–73–3
Transportation Systems Center

Sussman, E.D., Abernethy, C.N. III
34 p.
April 1973
Alcohol, Intoxication Interlock, Intoxicated Performance, Habitual Drinker.

This report contains the results of an experimental and analytical evaluation of instruments and techniques designed to prevent an intoxicated driver from operating his automobile. The prototype "Alcohol Safety Interlock Systems" tested were developed both by private industry and by the Transportation Systems Center and all were drawn from a class of instruments which detect intoxication by measuring changes in the subjects ability to perform a psychomotor task. The final report consists of the following documents:

Volume I, Summary Report - Summarizes all of the ASIS evaluation work performed through July 1972 and the results of the evaluation. Volume I is supported by an extensive appendix.

Volume II, Instrument Screening Experiments - Contains details of the experiments conducted by the Guggenheim Center, Harvard School of Public Health, including experimental procedures, results and some preliminary data analyses.

Volume III, Instrument Performance at High BAL- Contains the results of the experimental work performed by Dunlap and Associates, Inc., covering the performance of subjects with relatively high blood alcohol levels on selected instruments.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D C 20590

AIRCRAFT EMISSIONS SURVEY
DOT–TSC–OST–71–5
DOT/Transportation Systems Center
Accession No. PB-204794
Broderick, A.J., Harriott, W.F., Walter, R.A.

March 31, 1971
Air Pollution, Gas Turbines, Emissions, Jet Engines, Instrumentation.

For primary bibliographic entry, see Field 1.

A COMMUNITY NOISE SURVEY OF MEDFORD, MASSACHUSETTS
DOT–TSC–OST–72–1
Transportation Systems Center
Accession No. PB-211975
Noise Abatement Group
594 p.
August 1971
Noise Abatement, Transportation Noise, Community Noise Levels.

A noise measurement survey was conducted in Medford, Massachusetts, in order to assess the effect of transportation noise sources on the noise levels in typical small city, and to obtain data to validate a mathematical simulation model developed for the prediction of community noise levels. Weekday measurements were made at 49 locations in the city. At five of these locations, measurements were taken for approximately 40 minutes each hour for an entire 24--hour period. At the remaining 44 locations, measurements were made for approximately one hour during the morning traffic rush hour, and for an hour at midday.

This report of the noise measurement survey contains detailed tabulations of the noise levels measured, time history charts, noise level analyses, site descriptions, and other information pertinent to the evaluation of community noise levels.

The overall average median noise level from all locations was 55.0 dBA for the morning rush hour, and 51.8 dBA for the midday period. The highest noise levels were measured near heavily traveled highways. Railroad traffic had no significant influence on the community noise levels, and aircraft influenced the overall noise levels only to a limited extent.

MEASUREMENT OF AMBIENT NOISE LEVELS IN THE FLORIDA EVERGLADES
DOT–TSC–OST–72–2
Department of Transportation
Accession No. PB-212197
Quinn, R.W.
54 p.
September 1971
Noise Levels, Aircraft Noise, Noise Measurement.

Noise data recorded in and around a 100-square mile area of southern Florida during the period 16-22 March 1971 have been analyzed in the Noise Abatement Laboratory, Transportation Systems Center, Cambridge, Massachusetts. Nine locations were selected for measurement to obtain representative ambient noise levels in the area.

Tabulated data display a summary of the measured noise levels at each location, and include calculated values including the A-weighted noise levels exceeded 10%, 50%, and 90% of the measurement periods at each location.

THE NOISE EXPOSURE MODEL MOD 5 VOLUME 1
DOT–TSC–OST–72–5
Transportation Systems Center
Accession No. PB-211979
Taub, J., Foreman, T., Brownfield, B.
94 p.
November 1971
Noise Abatement, Airport Aircraft Noise.

This report contains three sections. The first two sections are contained in Volume 1 and may be described as follows:

Section 1. Airport Analysis - This section describes the Noise Exposure Model MOD-5 from the perspective of analysing an airport in order to develop the program input model.

Section 2. User's Manual - This section describes the process of developing the input model for the Noise Exposure Model MOD-5 from input data.

The final section will be published as Volume 2 and will be a programmer's manual. The purpose of this section will be to describe the Noise Exposure Model MOD-5 Computer Program.

THE NOISE EXPOSURE MODEL MOD 5 VOLUME 2
DOT–TSC–OST–72–5
Transportation Systems Center
Accession No. PB-211976
Taub, J., Foreman, T., Brownfield, B.
175 p.
November 1971
Noise Abatement, Airport Aircraft Noise.

This volume is the Programmer's Manual describing the Noise Exposure Model MOD-5 Computer Program.

Volume 1 is the airport analysis and user manual. Volume 2 was revised in March of 1972 to correct inconsistancies in the initial version.

COMPUTER MODELING OF TRANSPORTATION-GENERATED AIR POLLUTION–A STATE-OF-THE-ART SURVEY
DOT–TSC–OST–72–20
Transportation Systems Center

Darling, E.M. Jr.
131 p.
June 1972
Computer Modeling, Air Pollution, Transportation Pollution Sources.

This report surveys the state-of-the-art in air pollution modeling with particular emphasis on the modeling of dispersion from transportation sources. Models which have actually been implemented are stressed and the computational aspects of these models are treated in detail. Applications are discussed and validations are critically assessed. It was found that Gaussian and conservation of mass models are currently the most widely used tools for analyzing the dispersion of pollutants in the atmosphere. Models presently in operation are run on medium to large-scale computers of the IBM 360/50 class or greater and nearly all of these models are programmed in FORTRAN IV. Although existing models have been applied to a wide variety of air pollution problems, their performance has not been adequately evaluated. This deficiency is primarily due to the fact that, until recently, instrumented transportation test sites have not existed and hence very little validation data have heretofore been generated. However, such test sites do now exist and data from them is beginning to become available, hence the validation of dispersion models will soon be feasible.

PRELIMINARY OPERATIONAL REQUIREMENTS AND ACCEPTABILITY CRITERIA FOR THE COOPERATIVE BREATH ANALYZER
DOT–TSC–251–1
Dunlap and Associates, Inc.
Accession No. PB-211013
Oates, J.R. Jr., Jacobs, H.H.
22 p.
September 1971
Alcohol Measurements, Alcohol Breath Testing.

This report presents a series of criteria and requirements relevant to establishing user acceptability for the cooperative alcohol analyzer being developed by the Transportation Systems Center.

The information presented herein was obtained with the cooperation of police officials, judicial personnel, Alcohol Safety Action Project (ASAP) officials and government officials.

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FIELD TEST PLAN FOR EVALUATING THE COOPERATIVE BREATH ANALYZER
DOT–TSC–251–2
Dunlap and Associates, Inc.
Accession No. PB-211407
Oates, J.F. Jr., Jacobs, H.H.
48 p.
September 1971
Alcohol Measurements, Alcohol Breath Testing.

This report provides basic inputs to the Transportation Systems Center for their continuing development and evaluation of cooperative breath analyzers. Its primary purpose is to indicate a number of potential field test sites and to describe various available testing modalities.

*** METHODOLOGIES FOR ESTIMATING THE EFFECTIVENESS OF ALCOHOL SAFETY INTERLOCK SYSTEMS**
DOT–TSC–251–3
Dunlap and Associates, Inc.

Oates, J.F. Jr., McCay, R.T.
49 p.
November 1971
Alcohol Measurements, Measures Of Effectiveness.

This report provides methods and techniques to the Transportation Systems Center to support evaluation of Alcohol Safety Interlock Systems presently under development.

LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOLUME III–INSTRUMENT PERFORMANCE AT HIGH BAL
DOT–TSC–251–4
Dunlap and Associates, Inc.

Oates, J.F. Jr., McCay, R.T.
124 p.
April 1973
Alcohol, Intoxication, Interlock, Intoxicated Performance, Habitual Drinker.

This report contains the results of an experimental and analytical evaluation of instruments and techniques designed to prevent an intoxicated driver from operating his automobile. The prototype "Alcohol Safety Interlock Systems" tested were developed both by private industry and by the Transportation Systems Center and were all drawn from a class of instruments which detect intoxication by measuring changes in the subjects ability to perform a psychomotor task. The final report consists of the following documents:

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Volume II, Instrument Screening Experiments-Contains details of the experiments conducted by the Guggenheim Center, Harvard School of Public Health, including experimental procedures, results and some preliminary data analyses.

Volume III, Instrument Performance at High BAL-Contains the results of the experimental work performed by Dunlap and Associates, Inc., covering the performance of subjects with relatively high blood alcohol levels on selected instruments.

7. CHEMISTRY

Includes the following Groups: Chemical Engineering, Inorganic Chemistry; Organic Chemistry; Physical Chemistry, Radio and Radiation Chemistry.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D C 20590

ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 KHZ (100 KM) - 3,000 THZ (0.1 μM)
DOT–TSC–NASA–71–6
Transportation Systems Center
Accession No. N71-20121
Thompson, W.I. III
300 p.
February 1971
Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, Ultraviolet.

For primary bibliographic entry, see Field 4.

METALLIZATION FAILURES
DOT–TSC–NASA–71–9
Transportation Systems Center
Accession No. N72-13390
Beatty, R.
116 p.
May 1971
Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, Beam Lead Technology.

Metallization-related failure mechanisms are a major cause of integrated circuit failures under accelerated stress and field operation conditions. Industry's approach has been, (1) a better understanding of the aluminum system, now the most widely used material, and (2) evaluation of alternative metal systems.

The newer and more complex multilevel metallization systems require low temperature deposition techniques and critical etching-through methods due to smaller geometry and closer spacing.

Aluminum metallization offers many advantages, but also has limitations. Alternative materials are being considered for large scale integrated arrays. This survey defines the merits and restrictions of metallization systems in current usage and those under development. Although no specific recommendations are made references can be drawn from the data presented. The advanced state of beam lead technology is apparent.

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8. EARTH SCIENCES AND OCEANOGRAPHY

Includes the following Groups: Biological Oceanography; Cartography; Dynamic Oceanography; Geochemistry; Geodesy; Geography; Geology and Mineralogy; Hydrology and Limnology; Mining Engineering; Physical Oceanography; Seismology; Snow, Ice, and Permafrost; Soil Mechanics; Terrestrial Magnetism.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION
DOT–TSC–CG–71–3
Transportation Systems Center
Accession No. PB-204805
Lifsitz, J.R., Ingrao, H.C.

June 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

The detection of coastal fog banks by remote sensing methods is discussed. The feasibility of laser backscattering (LIDAR) and infrared radiometry is explored in detail. These techniques are analyzed theoretically and experimental data are presented supporting the analysis. A design study is carried out for several laser systems, considering safety, reliability, cost, convenience, efficiency and maximum range. A fog bank detector utilizing a GaAs laser array is described which best satisfies these criteria. Before the prototype design is selected, a brief in situ test program is recommended, using apparatus designed at the Transportation Systems Center under Contract No. CG-02/99-712104, with the U.S. Coast Guard. In addition to clarifying several critical questions underlying the LIDAR design, the proposed test program would allow further evaluation of the infrared radiometric method. The latter technique, if its reliability can be verified, offers the advantages of being simpler and less expensive for fog bank detection than the LIDAR method.

AN INVESTIGATION OF OIL FLUORESCENCE AS A TECHNIQUE FOR THE REMOTE SENSING OF OIL SPILLS
TSC–USCG–71–7
DOT/Transportation Systems Center
Accession No. PB-204792
Fantasia, J.F., Hard, T.M., Ingrao, H.C.

Oil Spills, Oil, Remote Sensing, Oil Fluorescence, Laser.

The feasibility of remote sensing of oil spills by laser-excited oil fluorescence is investigated. The required parameters are measured in the laboratory; these parameters are fed into a physical model to predict signal and background levels; and the predictions are verified by field experiments. Airborne detection, identification, and quantification of oil spills at sea are shown to be feasible with existing equipment, day or night.

FOG BANK DETECTOR FIELD TESTS: A TECHNICAL SUMMARY
DOT–TSC–USCG–72–2
Transportation Systems Center

Lifsitz, J.R., Yaffee, M.Y.
36 p.
December 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

This report summarizes the results of field experiments performed at Pt. Bonita, California, under the auspices of the U.S. Coast Guard, to test certain technical and operational assumptions underlying the design of a fog bank detector. The system under study, a laser LIDAR and a vertical-scanning infrared radiometer, have been discussed in detail in Report No. DOT-TSC-CG-71-3. Measurements of the peak power and shape of the return LIDAR pulse, and of the background levels, support the assumptions made in that report. The largest value of background spectral radiance measured, when a sunlit cloud fills the LIDAR receiver field-of-view, is 2 μw/cm^2/Å/sr (at 6943 Å). The infrared radiometer was found to be susceptible to ambiguities serious enough to eliminate this method from use as a reliable fog detector at the present time. Based on the laser backscatter results, a LIDAR fig bank detector, using a GaA1As laser diode array as the transmitting source, is recommended and conclusions regarding its technical performance are presented.

* **FOG BANK DETECTION SYSTEM ENGINEERING REQUIREMENTS AND TECHNICAL CONSIDERATIONS REQUIRED FOR A PERFORMANCE SPECIFICATION**
DOT–TSC–USCG–72–6
Transportation Systems Center

Lifsitz, J.R., Ingrao, H.C.
42 p.
April 1973
LIDAR, Fog Detection, Coast Guard.

This report outlines the engineering requirements for a Lidar Fog Bank Detection System utilizing a GaA1As laser diode array illuminator. Detailed operating characteristics are given for the system's major units. Technical considerations pertinent to the development of a performance specification are included.

The proposed requirements are derived from experiments reported in Final Report DOT-TSC-USCG-72-2, "Fog Bank Detector Field Tests: A Technical Summary," by J.R. Lifsitz and Melvin Y. Yaffee.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 72
DOT–TSC–FAA–72–26
Transportation Systems Center
Accession No. AD757274
Gagne, G.A., Hershkowitz, R.M.
76 p.
August 1972
Air Traffic Control, Collision Risk Model, Hybrid-Inertial Navigation, Satellite Surveillance, Latitude, Vertical, Longitudinal Separation.

This report summarizes the Oceanic Surveillance and Navigation Analysis performed, at or under the direction of, the Transportation Systems Center under PPA FA-204 for FY72. A methodology has been developed by Systems Control, Inc. for relating the safety (collision risk) of the North Atlantic organized Track System in the lateral dimension to the general characteristics of the on-board navigation system, the independent satellite surveillance system and the ATC procedures. The initiation of this effort by TSC was reported in TR DOT—TSC—FAA—71—13. The analysis and results are detailed herein. Extensions of this methodology to the latitude and vertical dimensions are also discussed and preliminary results are presented. A study has also been initiated to investigate and evaluate various configurations of aided navigation system in the NAT region. The requirements, goals, and contract award for this study are reviewed.

NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION
WASHINGTON, D C 20590

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EARTH SURVEY BIBLIOGRAPHY: A KWIC INDEX OF REMOTE SENSING INFORMATION
DOT—TSC—NASA—70—1
Transportation Systems Center
Accession No. N71-26398
Thompson, W.I. III
265 p.
February 1971
Earth Resources, Infrared, Radar, Visible, Microwaves.

This bibliography represents a collection of 1650 bibliographic citations on remote sensing of the physical characteristics of the Earth. This bibliography is intended to be used as a source document leading to additional information.

ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 KHZ (100 KM) - 3,000 THZ (0.1 μM)
DOT—TSC—NASA—71—6
Transportation Systems Center
Accession No. N71-20121
Thompson, W.I. III
300 p.
February 1971
Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, Ultraviolet.

For primary bibliographic entry, see Field 4.

OFFICE OF THE SECRETARY
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AMBIENT NOISE LEVEL MEASUREMENTS IN PROPOSED FLORIDA AIRPORT AREA
DOT—TSC—OST—72—19
Transportation Systems Center
Accession No. PB-214459
Quinn, R.W.
120 p.
December 1972
A-Weighted Sound Level, Walsh-Healey Exposure, Median Noise Level, L-10 Noise Level, Noise-Pollution Level.

This report documents the measurement results made at ten locations near the three remaining sites being studied for the "South Florida Regional Airport."

Tabulated data display a summary of the measured noise levels at each location expressed as noise levels exceeded 1, 10, 50, 90 and 99 percent of the time in A-weighted decibels. The standard deviation, minimum and maximum A-weighted levels are also tabulated.

9. ELECTRONICS AND ELECTRICAL ENGINEERING

Includes the following Groups: Components; Computers; Electronic and Electrical Engineering; Information Theory; Subsystems; and Telemetry.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

EN ROUTE AIR TRAFFIC FLOW SIMULATION
DOT–TSC–FAA–71–1
Transportation Systems Center
Accession No. AD 751929
Medeiros, M.F. Jr.
66 p.
January 1971
Flow Control, Air Traffic Control, Central Flow Control Facility, Automation, Information Retrieval, Airport Information, Flow Control Procedures.

For primary bibliographic entry, see Field 1.

* **HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**
DOT–TSC–FAA–71–2
Transportation Systems Center

Hilborn, E.H.
18 p.
January 1971
Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, Display Problems.

For primary bibliographic entry, see Field 1.

CONCEPTUAL NETWORK MODEL OF THE AIR TRANSPORTATION SYSTEM. THE BASIC, LEVEL 1 MODEL
DOT–TSC–FAA–71–3
Transportation Systems Center
Accession No. AD733752
de Hollan, A.N., Priver, A.S.
44 p.
April 1971
Conceptual Transportation Systems Model, Flight Simulation, Input Package, Output Package.

For primary bibliographic entry, see Field 1.

REAL-TIME SIMULATION PROGRAM FOR DE HAVILLAND (CANADA) "BUFFALO" AND "TWIN OTTER" STOL TRANSPORTS
DOT–TSC–FAA–71–14
Transportation Systems Center
Accession No. AD74420
MacDonald, R.A., Garelick, M., Haas, J.

June 25, 1971
Aircraft Math Models, STOL Aircraft Stability And Control, Aircraft Simulation.

For primary bibliographic entry, see Field 1.

LARGE SCALE SYSTEMS-A STUDY OF COMPUTER ORGANIZATIONS FOR AIR TRAFFIC CONTROL APPLICATIONS
DOT–TSC–FAA–71–15
DOT/Transportation Systems Center
Accession No. AD733759
Dumanian, J., Clapp, D.
152 p.
June 15, 1971
Computers, NAS Stage A Data Processing, ARTS III Data Processing.

For primary bibliographic entry, see Field 1.

SYSTEM RELIABILITY AND RECOVERY
DOT–TSC–FAA–71–16
DOT/Transportation Systems Center
Accession No. AD733760
Dancy, C.A. III
61 p.
June 15, 1971
Reliability, Recovery, Reconfiguration, Multiprocessor, Failsafe/Soft.

For primary bibliographic entry, see Field 1.

DISPERSED PROCESSING FOR ATC
DOT–TSC–FAA–71–20
DOT/Transportation Systems Center
Accession No. AD733763
Paul, G.G., Snow, R.M.
16 p.
June 30, 1971
Dispersed Processing, Air Traffic Control, Remote Tracking, Data Link, Intermittent Positive Control, Discrete Addressing.

For primary bibliographic entry, see Field 1.

ADVANCED COMPUTER ARCHITECTURE FOR LARGE-SCALE REAL-TIME APPLICATIONS
DOT–TSC–FAA–72–21
Transportation Systems Center
Accession No. AD-758697
Wang, G.Y.
186 p.
April 1973
Parallel Processor, Associative Processor, Multiprocessing, Memory Allocation, Dynamic Task Scheduling, Graph Modelling, Air Traffic, Real-Time Systems.

For primary bibliographic entry, see Field 1.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES
DOT–TSC–FRA–71–1A
Transportation Systems Center
Accession No. PB-210743
Raposa, F.L.
65 p.
February 1971
Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, Wayside Electric Power.

The linear induction motor is to provide the propulsion of high-speed tracked vehicles and speed control of the motor is essential for vehicle operation.

The purpose of power conditioning is to provide the matching interface between the available power and the desired power for driving the motor. As an integral part of the propulsion system the power conditioner provides the means for controlling both the thrust and the braking of the vehicle.

This interim technical report identifies and describes candidate power conditioners for driving linear induction motors in the variable frequency power mode. The power conditioners described include those for application with either on board electric power sources or with wayside electric power sources.

METROLINER AUXILIARY POWER ELECTRICAL SYSTEM RELIABILITY STUDY
DOT–TSC–FRA–71–2
U.S. Department of Transportation
Accession No. PB-204795
Abbas, J.D., Watt, C.W. Jr.
135 p.
June 1971

The reliability of the electrical system of any vehicle is greatly affected by the way the system is configured. The propulsion and braking systems of a train must be unaffected by failures occurring in the nonessential power areas. With these criteria in mind the so-called "Auxiliary Power System" of the Metroliner car was analyzed. This auxiliary power system was found to be deficient in achieving these ends. Recommendations suggest methods of satisfying these criteria by segregating the essential from the nonessential elements, thereby enhancing the overall availability of the Metroliner car.

TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS
DOT–TSC–FRA–71–3
U.S. Department of Transportation
Accesssion No. PB-204796
Hopkins, J.B., Hazel, M.E.

June 1, 1971
Grade Crossing Protection, Train Detection, Microwave Telemetry, Railroad Signals.

The constraints on innovative grade crossing protective systems are delineated and guidelines for development indicated. Inventory data has been arranged to permit an estimate of the classes of systems needed, the allowable costs, and contribution of various types of crossings to accidents. Many crossings warrant very limited expense and account for very few deaths. A number of approaches are possible for the intermediate cost classes, based on use of conventional signals with low-cost activation systems. Use of similar elements, singly or in combination, can also improve effectiveness of more expensive systems. The very high cost locations may well benefit from interconnection of train and vehicle detectors and small computers.

Extensive analysis and laboratory investigation has been carried out relating to a microwave telemetry alternative to conventional track circuits and possible crossing-located radar and impedance train detection systems.

SIMULATION OF POWER COLLECTION DYNAMICS FOR SIMPLY SUPPORTED POWER RAIL
DOT–TSC–FRA–72–1
Transportation Systems Center
Accession No. PB-204795
Spenny, C.H.
48 p.
November 1972
Power Collection, High Speed Tracked Vehicles.

The mathematical model of a sprung mass moving along a simply supported beam is used to analyze the dynamics of a power-collection system. A computer simulation of one-dimensional motion is used to demonstrate the phenomenon of collector-power rail interaction. Parametric resonance in an undamped collector is shown to exist at several speeds below 300 miles per hour. However, it is demonstrated that amplitude can be controlled at all of these resonant speeds with the proper use of damping.

NONCONTACT POWER COLLECTION FOR HIGH-SPEED GROUND TRANSPORTATION SYSTEMS
DOT–TSC–FRA–72–7
Transportation Systems Center

Stickler, J.J.
43 p.
July 1972
Noncontact Power Collection, Electric Arc, Inductive Coupling, Capacitive Coupling, Electromagnetic Coupling.

An evaluation is made of four basic noncontacting techniques of power collection which have possible applicability in future highspeed ground transportation systems. The techniques considered include the electric arc, magnetic induction, electrostatic (capacitive) coupling, and electromagnetic waveguide coupling. The report concludes that the electric arc is the only feasible technique from the standpoint of power coupling efficiency and design practicality.

A test program is recommended for investigating the power transfer capabilities of the arc coupler. Details of an experimental test setup are presented which can be used to obtain empirical data required for the design of a prototype unit.

PULSE TRANSMISSION OVER DISPERSIVE WAVEGUIDES IN RAILROAD COMMUNICATIONS: SOFTWARE FOR COMPUTER SIMULATION
DOT–TSC–FRA–72–11
Transportation Systems Center

Eaves, R.E.
60 p.
July 1973
Railroad Trains, Communications, Electromagnetic, Electromagnetic Wave Transmission, Distortion, Signal Wave Dispersion, Transmission.

Waveguides and transmission lines employed in train communications exhibit dispersion, which is caused by (a) their inherent properties and (b) the cumulative effect of discontinuities at joints. To provide the means to evaluate such waveguides, several computer programs have been developed to analyze and simulate the effect of dispersion on pulse transmission.

THE EFFECT OF SOLID STATE POWER CONVERTER HARMONICS ON ELECTRIC POWER SUPPLY SYSTEMS
DOT–TSC–FRA–72–12
Alexander Kusko, Inc.

Kusko, A.
38 p.
March 1973
Power Harmonic Effects, Solid-State Converter Harmonics.

The United States utility industry has not set suitable standards other than TIF (Telephone Interference Factor), for controlling the design of solid-state wayside and on-board power-conversion equipment, to limit the harmonic currents and voltages in both the transit and electric-power-supply systems. To reduce interference with telecommunications and control equipment, and to insure reliable operation of power equipment, the manufacturers can attenuate the power harmonics by selecting the converter pulse number and by the use of filters. Techniques for calculating the harmonic voltages have been developed and can be applied to transit systems. We propose a standard of 10 percent of fundamental amplitude for each harmonic voltage at the connection point to the utility and 3 percent for each harmonic voltage within the transit system such as the power rails.

* **DYNAMIC TEST PROGRAM, CONTACT POWER COLLECTION FOR HIGH SPEED TRACKED VEHICLES**
DOT–TSC–FRA–72–17
Transportation Systems Center

Spenny, C.H.
34 p.
April 1973
Power Collection, High Speed Tracked Vehicles.

A laboratory test program is defined for determining the dynamic characteristics of a contact power collection system for a high speed tracked vehicle. The use of a hybrid computer in conjunction with hydraulic exciters to simulate the expected dynamic environment is described. A laboratory setup for examining the effects of brush friction is also described.

* **SURVEY OF METROLINER TELEPHONE USERS AND COMPUTER PROGRAMS FOR ANALYZING TELEPHONE CHANNEL CAPACITY AND LOADING**
DOT–TSC–FRA–73–5
Transportation Systems Center

Chin, G.Y., Eaves, R.E., Yoh, P.
58 p.
July 1973
Railway Communication, Telephone-Channel Capacity.

The results of the survey of the Metroliner telephone users show that 11.5 percent of the passengers used the telephone. Among the users, 71 percent had to wait, 73.5 percent of the passengers recommended telephone service, and 37.2 percent for television. The average telephone demand was estimated. Three computer programs were provided for: (1) space-time diagram of the trains on the track, (2) the number of trains on the track, and (3) the telephone channel-capacity distribution of each train including the loading factor of each channel.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON, D C 20590

EVALUATION OF NONDESTRUCTIVE TENSILE TESTING
DOT–TSC–NASA–71–10
DOT/Transportation Systems Center
Accession No. N71-3756
Bowe, J.J., Polcari, S.M.

May 1971
Semiconductor Devices, Nondestructive Testing, Chip and Wire Bonding.

This report presents the results of a series of experiments performed in the evaluation of nondestructive tensile testing of chip and wire bonds. Semiconductor devices were subjected to time-temperature excursions, static-load life testing and multiple pre-stressing loads to determine the feasibility of a nondestructive tensile testing approach. The report emphasizes the importance of the breaking angle in determining the ultimate tensile strength of a wire bond, a factor not generally recognized nor implemented in such determinations.

METALLIZATION FAILURES
DOT–TSC–NASA–71–9
Transportation Systems Center
Accession No. N72-13390
Beatty, R.
116 p.
May 1971
Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, Beam Lead Technology.

For primary bibliographic entry, see Field 7.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION WASHINGTON, D C 20590

OCCUPANT MOTION SENSORS
DOT–TSC–NHSB–71–1
Transportation Systems Center
PB–204–808
Horner, J. L.
54 p.
March 1971
Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, Transducers.

An analysis has been made of methods for measuring vehicle occupant motion during crash or impact conditions. The purpose of the measurements is to evaluate restraint system performance using human, anthropometric dummy, or animal occupants. A detailed Fourier frequency analysis is made of the sensor requirements. Potential candidate systems are evaluated, and five of these recommended for further development and field testing.

OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS
DOT–TSC–NHTSA–71–4
Transportation Systems Center
PB–204–809
Horner, J. L., Ofsevit, D. S., Plant, G. R., Lawrence, G. G.
55 p.
Bandwidth, Rotational Motion, Fourier Analysis, Sensor, Transducer, Acceleration, Angular Motion, Digital Filtering.

A study has been made of methods for measuring occupant motion within a vehicle during crash or impact conditions. The purpose of the measurements is to evaluate restraint systems, using anthropometric dummy, animal, or human occupants.

A list of general specifications for occupant motion sensors was drawn up. This was used to establish criteria for evaluation of proposed systems. From a study of various possible systems, five were selected for further development. These systems were built and prepared for field testing. In addition, computer methods for Fourier analysis of the data produced by these systems have been developed in theory and in programs for a digital computer.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D C 20590

TRIP–THE TRANSPORTATION ROUTING AND INTERMODAL PLANNING SYSTEM: AN AID FOR TODAY'S TRAVELER
DOT–TSC–OST–71–3
Transportation Systems Center
Accession No. PB-204797
Kovatch, G., Taub, J.
35 p.
January 1971
TRIP, Computer Display Technology, Comparative Cost And Time Data.

The Transportation Routing and Intermodal Planning (TRIP) System was conceived as an aid to today's traveler. It assumes a traveler wishes to choose from all available modes of transportation generally air, automobile, rail, and bus. It is based on the utilization of current computer display technology. The TRIP System accepts information from the traveler in real time while the traveler sits at an input terminal. The information describes the individual travel needs and desires. The computer produces actual travel plans with comparative cost and time data for each mode. Results of a demonstration on existing TSC computer equipment are reported. (In this report, the concept is described and possibilities for future development and potential application are given.)

TRAFFIC CIRCLE MODEL
DOT–TSC–OST–71–6
Transportation Systems Center
Accession No. PB-204929
Englander, I.
14 p.
May 1971
Dynamic Model, Traffic Circle, CRT Display Terminal.

This report describes a dynamic model of a traffic circle which has been implemented on a CRT display terminal. The model includes sufficient parameters to allow changes in the structure of the traffic circle, the frequency of traffic introduced to the circle by each entering road, the model of entering the circle (right of way), the frequency of traffic leaving the circle by each road, and vehicular spacing toward the circle.

PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST ANALYSIS
DOT–TSC–OST–71–11
Transportation Systems Center
Accession No. PB-204801
Kovatch, G., Zames, G.

August 1, 1971
Transportation Systems Analysis, PRT Systems, Urban Transportation.

For primary bibliographic entry, see Field 5.

AN AIRPORT AIRSIDE SYSTEM MODEL
DOT–TSC–OST–71–12
Transportation Systems Center
Accession No. PB-204802
Englander, I.

June 1971

For primary bibliographic entry, see Field 1.

THE NOISE EXPOSURE MODEL MOD 4
DOT–TSC–OST–71–14
Transportation Systems Center
Accession No. PB-211977
Hinckley, R.H., Wesler, J.E.
90 p.
August 1971
Noise Exposure, Noise Exposure Forecast (NEF), Airport Noise.

The purpose of this report is threefold:
1. *To record the results of efforts at the Transportation Systems Center to refine and expand the Noise Exposure Model, which have specifically resulted in the MOD 4 version described herein;*
2. *To serve as a User's Manual for the preparation of input information for the Noise Exposure Model MOD 4; and*
3. *To document the computer program for the Noise Exposure Model MOD 4, primarily for the guidance of computer programmers.*

APPENDIX C: THE NOISE EXPOSURE MODEL MOD 4
DOT–TSC–OST–71–16
Transportation Systems Center
Accession No. PB-211978

57 p.
August 1971

AUTOMATED PATENT REPORTING SYSTEM
DOT–TSC–DLM–71–1
Transportation Systems Center

Farmer, H.E., Caso, C.J.
45 p.
October 1, 1971
Patent, Invention.

This report represents complete documentation of the Automated Patent Reporting System (APRS) currently in operation at the Transportation Systems Center. The APRS was developed to satisfy TSC and DOT patent reporting needs. It has been designed to operate in a batch mode on an IBM-7094. Programming is in COBOL in order to simplify potential conversions to the maximum extent possible. The eleven reports generated by the APRS fall into three major groups: (1) docket information, (2) category information, and (3) summary reports. Samples of the reports generated are contained in Appendix A to this document.

The APRS works very well, and we are glad to share our system with others. Any Patent Counsel wishing to implement the Automated Patent Reporting System should forward this document to his data processing personnel for reference.

***TRANSPORTATION ANALYSIS AND SIMULATION FACILITIES (TASF) PLANNING AND APPROACH**
DOT–TSC–OST–72–6
Transportation Systems Center

Miller, H.G., TASF Program Office
104 p.
January 1972
Computer, Simulation, Facility.

For primary bibliographic entry, see Field 5.

A BRIEF SURVEY OF TSC COMPUTING FACILITIES
DOT–TSC–OST–72–15
Transportation Systems Center

Zellweger, A.
31 p.
May 1972
Computers, Facility, Transportation Systems Center.

The Transportation Systems Center (TSC) has four, essentially separate, in-house computing facilities. We shall call them Honeywell Facility, the Hybrid Facility, the Multimode Simulation Facility, and the Central Facility. In addition to these four, several laboratories have their own minicomputers. This report reviews the hardware and software capabilities of these facilities. A final section discusses the strength and weaknesses of the current in-house general purpose computer capability.

A SURVEY OF AIRPORT ACCESS ANALYSIS TECHNIQUES–MODELS, DATA AND A RESEARCH PROGRAM
DOT–TSC–OST–72–17
Transportation Systems Center
Accession No. PB-220988
Brown, L., Paules, G.E., Roberts, E., Schaeffer, K.H.
172 p.
June 1972
Airport Access, Modal Split, Travel Survey Demonstrations.

The report points up the differences and similarities between airport access travel and general urban trip making. Models and surveys developed for, or applicable, to airport access planning are reviewed. A research program is proposed which would generate a standard airport technical planning package and establish a federal airport access planning assistance program to help local agencies in planning airport access demonstrations and improvements.

COMPUTER MODELING OF TRANSPORTATION-GENERATED AIR POLLUTION–A STATE-OF-THE-ART SURVEY
DOT–TSC–OST–72–20
Transportation Systems Center

Darling, E.M. Jr.
131 p.
June 1972
Computer Modeling Air Pollution, Transportation Pollution Sources.

For primary bibliographic entry, see Field 6.

FIVE-YEAR COMPUTER TECHNOLOGY FORECAST
DOT–TSC–OST–72–23
Transportation Systems Center

Zellweger, A.
102 p.
December 1972
Computers, Memories, Processors, Networks, Forecast.

This report delineates the various computer system components and extrapolates past trends in light of industry goals and physical limitations to predict what individual components and entire systems will look like in the second half of this decade. The report will emphasize the nature of components (e.g. CPUs, primary memories, secondary memories, ultra large storage devices, etc.) and the system architectures that will be commercially available as "off-the-shelf" items rather than one-of-a-kind systems that might exist in five years.

FY 72 COMPUTER UTILIZATION AT THE TRANSPORTATION SYSTEMS CENTER
DOT–TSC–OST–72–24
Transportation Systems Center
Accession No. PB-218461
Hiatt, D.B.
21 p.
August 1972
Digital Computers, Utilization Computers, Hours,Computers, Expenses Computers.

The Transportation Systems Center currently employs a medley of on-site and off-site computer systems to obtain the computational support it requires. Examination of the monthly User Accountability Reports for FY72 indicated that during the fiscal year TSC personnel made direct expenditures for the use of eighteen different digital computer systems - eight on-site systems and ten systems owned and maintained outside TSC. The magnitude of this usage was equivalent to a single CDC 6600 computer system. The total computation hours utilized were equivalent to 1860 CDC 6600 CPU hours - a single shift - and the estimated dollar value was $1.38 million - approximately the annual rental cost of a CDC 6600.

Examination of the pattern of this usage indicated that (a) TSC was still oriented toward hardware testing and component design - generally termed hard technology - in FY 72, and (b) TSC's scientific computer users rely on off-site systems for the bulk (69%) of their computer support.

THE USE OF MODELS IN URBAN TRANSPORTATION PLANNING
DOT–TSC–OST–72–25
Transportation Systems Center

Barker, W.G.
82 p.
April 1973
Urban Transportation Planning, Transportation Models, Computer Models.

The report describes the most commonly used models in urban transportation planning. A background on urban transportation planning is given including changes in planning objectives and the effects of Federal legislation. General concepts and problems in the use of the models are also presented. An assessment of the situation is made and recommendations for improvement are suggested.

ACCUMULATIVE PROBABILITY MODEL FOR AUTOMATED NETWORK TRAFFIC ANALYSES
DOT–TSC–OST–72–30
Transportation Systems Center
Accession No. PB-218460
Toye, C.R.
68 p.
October 1972
Modeling, Automated Guideway, Simulation, Dual Mode, Network.

This report presents an illustration of the accumulative probability model which is applicable to ground transportation systems where high-speed and close headways are a performance requirement. The paper describes the model, illustrates it with a hypothetical problem, and then applies it to a network route that was actually configured in a Dual mode system study.

The paper also describes and gives a listing of a computer program called Dual which is used to illustrate the model and simulate various route structures.

TRANSPORTATION CONTRACTORS

NORTH ATLANTIC SATELLITE ATC CENTER STUDY FINAL REPORT
DOT–TSC–50
International Business Machines Corporation
Accession No. PB-204862

297 p.
April 19, 1971
North Atlantic, Oceanic Control Center, Satellite System, Air Traffic Control.

A study of present oceanic ATC methods leads to the conclusion that ATC in the North Atlantic should continue to be based on an organized track concept in those areas where traffic densities are high. However, there is clearly a need to improve communications in the North Atlantic area, and a satellite system can provide both communications and surveillance services. The satellite oceanic control center (SOCC) described is highly automated. In implementing such a system it appears desirable initially to use surveillance data derived from the inertial navigation system (INS) and transmitted via data link to the control center. Subsequently, independent surveillance data could be implemented by a two-satellite tone ranging scheme, with the aircraft transponding encoded pressure altitude. The implementation data provided for the proposed SOCC includes data flow paths, sizing analysis, facility design, and staging plan.

AIRSPACE CONTROL ENVIRONMENT SIMULATOR–FINAL REPORT
DOT–TSC–131–3
Raytheon Company

Benham, F., Hatch, A., Kass, S.
233 p.
December 22, 1971
Simulation, ATC Experiments.

For primary bibliographic entry, see Field 1.

PWI TEST AND DEVELOPMENTAL RESOURCE UTILIZATION
DOT–TSC–188–1
Intermetrics, Incorporated
Accession No. PB-212495
Carlson, N.A., Grundy, P.A., Morth, H.R., Copps, E.M., Flanders, J.H.
228 p.
November 15, 1971
Electro-Optical PWI, Test Programs, Simulation Facilities, Evaluation Tools.

For primary bibliographic entry, see Field 1.

HIGH LEVEL DATA COMMUNICATION CONTROL PROCEDURES FOR AIR TRAFFIC CONTROL, COMPUTER-TO-COMPUTER DATA INTERCHANGE
DOT–TSC–235
Honeywell, Inc.

Huettner, R.E., Tymann, E.B.
56 p.
September 1971
Air Traffic Control, Control Procedures, Data Communication, Data Interchange.

For primary bibliographic entry, see Field 1.

URBAN MASS TRANSPORTATION ADMINISTRATION
WASHINGTON, D C 20590

BIBLIOGRAPHY ON GROUND VEHICLE COMMUNICATION & CONTROL: A KWIC INDEX
DOT–TSC–UMTA–71–3
Transportation Systems Center
Accession No. PB-204807
Thompson, W.I. III
191 p.
August 1971
Bibliography.

This bibliography covers the subject of communication and control of ground vehicles. This covers the fields of land-mobile communication, computer aided traffic control, communication with high speed ground vehicles, and radio frequency noise. Emphasis is placed on the 150, 450 and 900 MHz frequency bands.

The bibliography has two indexes: a key word in context, KWIC index; and an author index. There are 1100 citations in the bibliography.

A SURVEY OF VARIABLE VOLTAGE POWER CONDITIONERS FOR APPLICATION TO THE TRACKED AIR CUSHION VEHICLE
DOT–TSC–UMTA–71–4
Transportation Systems Center

Cacossa, R.A.
22 p.
March 1971
Solid State Switches, Induction Motors, Power Conditioning.

The linear induction motor (LIM) is a prime candidate for the propulsion of Tracked Air Cushioned High Speed Vehicles. Speed control of the LIM is essential for vehicle operation. It is expected that wayside power lines for the vehicle will carry fixed voltage/frequency three phase power. This report surveys possible power conditioning concepts that can be applied to the wayside power to effectively provide control of the LIM. The power conditioning concepts discussed in this report process variable voltage, fixed frequency power. For each case, some of the salient advantages and disadvantages are presented.

* **SURVEY OF SLIDING CONTACT/SOLID RAIL COLLECTION SYSTEMS FOR APPLICATION TO THE TRACKED AIR CUSHION VEHICLE**
DOT–TSC–UMTA–71–5
Transportation Systems Center

Spenny, C.H.
42 p.
March 1971
Power Collection, Sliding Contact Power Collection, High Speed Track Vehicles.

The objective of a power collection system is to deliver uninterrupted power from the wayside to a vehicle. In order to apply the third rail concept, used for subway power collection, to the tracked air cushion vehicle, considerable improvement must be made in the design to accommodate higher speed, higher power, and larger lateral motions. This report classifies sliding contact collectors for solid rails, discusses merits and problems with each, and surveys several existing and planned sliding contact collectors.

OPERATION DIAL-A-RIDE DISPATCHING PROGRAM: INSTRUCTIONS FOR USING THE SYSTEM TAPE
DOT–TSC–UMTA–71–7
Transportation Systems Center

Bushueff, B.P. Jr.
20 p.
September 1971
Dial-A-Ride, Dial-A-Bus, Computer Dispatching, Bus Routing, Dispatching Algorithms Computer Aided Routing.

This handbook contains notes and instructions on using the magnetic tapes that contain the Operational Dial-A-Ride computer dispatching program that was produced by MIT Urban Systems Laboratory under Grant Mass MTD-6, for the Department of Transportation Urban Mass Transit Administration.

OPERATIONAL DIAL-A-RIDE COMPUTER PROGRAM, TEST AND EVALUATION REPORT VOLUME I
DOT–TSC–UMTA–72–1
Transportation Systems Center

Bellantoni, J.F.
142 p.
September 30, 1971
Demand Responsive Systems, Dial-A-Ride, Dial-A-Bus, Operational D-A-R, Computer Dispatching.

This report presents the results of the evaluation of the MIT Urban Systems Laboratory's (USL's) Dial-A-Ride operational computer program. The evaluation was carried out by the Transportation Systems Center (TSC) under PPA UM-02, "Transportation Systems Computer Package", FY'72. The general purpose of the evaluation was to test the Operational Dial-A-Ride (O D-A-R) DOS program against the work statement of November 24, 1970, for extension of the UMTA Grant MASS-MTD-6.

OPERATIONAL DIAL-A-RIDE COMPUTER PROGRAM, TEST SCENARIOS AND TEST DATA, VOLUME II
DOT–TSC–UMTA–72–1
Transportation Systems Center

Bellantoni, J.F.
142 p.
September 30, 1971
Demand Responsive Systems, Dial-A-Ride, Dial-A-Bus, Operational D-A-R, Computer Dispatching.

This report presents the results of the evaluation of the MIT Urban Systems Laboratory's (USL's) Dial-A-Ride operational computer program. The evaluation was carried out by the Transportation Systems Center (TSC) under PPA UM-02, "Transportation Systems Computer Package", FY'72. The general purpose of the evaluation was to test the Operational Dial-A-Ride (O D-A-R) DOS Program against the work statement of November 24, 1970, for extension of the UMTA Grant MASS-MTD-6.

10

10. ENERGY CONVERSION (NON-PROPULSIVE)

Includes the following Groups: Conversion Techniques; Power Sources; Energy Storage.

OFFICE OF THE SECRETARY
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WASHINGTON, D C 20590

RESEARCH AND DEVELOPMENT OPPORTUNITIES FOR IMPROVED TRANSPORTATION ENERGY USAGE
DOT–TSC–OST–73–14
Transportation Systems Center
Accession No. PB-220612
Transportation Energy Panel
94 p.
September 1972
Transportation, Energy, Transportation Energy, Energy Utilization, Fuel Economy, Heat Engines.

The almost complete dependence of transportation systems upon petroleum products makes the transportation sector vulnerable to increased prices of petroleum or insecure sources of petroleum. Since the dependence of transportation upon imported petroleum is projected to increase substantially over the next two decades, both short- and long-term remedial actions should be initiated now and in the next few years because of the long time needed to bring about evolutionary changes in the Nation's transportation systems. Possible remedial actions include:

1. *Technological improvements for more efficient use of petroleum by transportation.*
2. *Technological changes to permit greater use of non-petroleum energy resources by transportation.*
3. *Shift of transportation demand to more efficient modes from less efficient modes.*
4. *Reduction of demand for transportation service.*

Transportation energy demand projections are given and R&D tasks in each of the first three categories are assessed.

URBAN MASS TRANSPORTATION
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WASHINGTON, D C 20590

* **SURVEY OF SLIDING CONTACT/SOLID RAIL COLLECTION SYSTEMS FOR APPLICATION TO THE TRACKED AIR CUSHION VEHICLE**
DOT–TSC–UMTA–71–5
Transportation Systems Center

Spenny, C.H.
42 p.
March 1971
Power Collection, Sliding Contact Power Collection, High Speed Track Vehicles.

For primary bibliographic entry, see Field 9.

11

11. MATERIALS

Includes the following Groups: Adhesives and Seals; Ceramics, Refractories, and Glasses; Coatings, Colorants, and Finishes; Composite Materials; Fibers and Textiles; Metallurgy and Metallography; Miscellaneous Materials; Oils, Lubricants, and Hydraulic Fluid; Plastics; Rubbers; Solvents, Cleaners, and Abrasives; Wood and Paper Products.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

SURVEY OF METEOROLOGICAL REMOTE SENSORS
DOT–TSC–CG–71–1
Transportation Systems Center
Accession No. PB-204793
Barrington, A.E.

May 1971
Meteorology, Remote Sensing, Data Buoy, Instrumentation.

For primary bibliographic entry, see Field 4.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D C 20590

MILLIMETER-WAVE GENERATION WITH SPIRALING ELECTRON BEAMS
DOT–TSC–NASA–71–7
Transportation Systems Center

Kulke, B.
98 p.
February 1971
Spiraling Electron Beam, Microwave Cavity, 9.4 and 94 GHz, High-Power Millimeter Waves.

An investigation has been carried out of the feasibility of using the interaction between a thin, solid, spiraling electron beam of 10-20kV energy and a microwave cavity to generate watts of CW millimeter-wave power. Experimental results are given for several prototype devices operating at 9.4 GHz and at 94 GHz. Power outputs of 5W, and electronic efficiencies near 3%, were obtained at X-band, and moderate gain was obtained at 94 GHz. The small-signal theory gives a good fit to the X-band data, and the device behavior at 94 GHz is as expected from the given beam characteristics. The performance is limited chiefly by the velocity spread in the spiraling electron beam, and once this can be brought under control, high-power generation of millimeter waves appears quite feasible with this type of device.

METALLIZATION FAILURES
DOT–TSC–NASA–71–9
Transportation Systems Center
Accession No. N72-13390
Beatty, R.
116 p.
May 1971
Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, Beam Lead Technology.

For primary bibliographic entry, see Field 7.

12

12. MATHEMATICAL SCIENCES

NO REPORTS

13

13. MECHANICAL, INDUSTRIAL, CIVIL, AND MARINE ENGINEERING

Includes the following Groups: Air Conditioning, Heating, Lighting and Ventilating; Civil Engineering; Construction Equipment, Materials, and Supplies; Containers and Packaging; Couplings, Fittings, Fasteners, and Joints; Ground Transportation Equipment; Hydraulic and Pneumatic Equipment; Industrial Processes; Machinery and Tools; Marine Engineering; Pumps, Filters, Pipes, Fittings, Tubing, and Valves; Safety Engineering; Structural Engineering.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION
DOT–TSC–CG–71–3
Transportation Systems Center
Accession No. PB-204805
Lifsitz, J.R., Ingrao, H.C.

June 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

For primary bibliographic entry, see Field 8.

FOG BANK DETECTOR FIELD TESTS: A TECHNICAL SUMMARY
DOT–TSC–USCG–72–2
Transportation Systems Center

Lifsitz, J.R., Yaffee, M.Y.
36 p.
December 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

For primary bibliographic entry, see Field 8.

USCG POLLUTION ABATEMENT PROGRAM: A PRELIMINARY STUDY OF VESSEL AND BOAT EXHAUST EMISSIONS
DOT–TSC–USCG–72–3
Transportation Systems Center
Accession No. PB-210417
Walter, R.A., Broderick, A.J., Sturm, J.C., Klaubert, E.C.
129 p.
November 30, 1971
Vessel And Boat Emissions, Marine Air Pollution, Coast Guard Fleet Emissions, Air Quality.

For primary bibliographic entry, see Field 4.

* **FOG BANK DETECTION SYSTEM ENGINEERING REQUIREMENTS AND TECHNICAL CONSIDERATIONS REQUIRED FOR A PERFORMANCE SPECIFICATION**
DOT–TSC–USCG–72–6
Transportation Systems Center

Lifsitz, J.R., Ingrao, H.C.
42 p.
April 1973
LIDAR, Fog Detection, Coast Guard.

For primary bibliographic entry, see Field 8.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES
DOT–TSC–FRA–71–1A
Transportation Systems Center
Accession No. PB-210743
Raposa, F.L.
65 p.
February 1971
Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, Wayside Electric Power.

For primary bibliographic entry, see Field 9.

METROLINER AUXILIARY POWER ELECTRICAL SYSTEM RELIABILITY STUDY
DOT–TSC–FRA–71–2
U.S. Department of Transportation
Accession No. PB-204795
Abbas, J.D., Watt, C.W. Jr.
135 p.
June 1971

For primary bibliographic entry, see Field 9.

TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS
DOT–TSC–FRA–71–3
U.S. Department of Transportation
Accession No. PB-204796
Hopkins, J.B., Hazel, M.E.

June 1, 1971
Grade Crossing Protection, Train Detection, Microwave Telemetry, Railroad Signals.

For primary bibliographic entry, see Field 9.

* **DIESEL LOCOMOTIVE EXHAUST EMISSION CONTROL AND ABATEMENT**
DOT–TSC–FRA–72–6
Transportation Systems Center

Hergenrother, K.M.
18 p.
June 1972
Diesel Locomotive, Exhaust Emissions, Air Pollution.

For primary bibliographic entry, see Field 6.

POWER CONDITIONING FOR HIGH SPEED TRACKED VEHICLES
DOT–TSC–FRA–72–13
Transportation Systems Center

Raposa, F.L., Knutrud, T., Wawzonek, J.J.
252 p.
January 1973
Variable Frequency Power, Power Conditioning.

The linear induction motor is to provide the propulsion of high-speed tracked vehicles; speed and brake control of the propulsion motor is essential for vehicle operation. The purpose of power conditioning is to provide the power matching interface between the available power and the desired power for driving the propulsion motor.

This report presents a technical survey of power conditioners that are applicable for driving the linear induction motor in the variable frequency power mode. Power conditioning systems have been selected for technical evaluation and the results are also presented in this report. These systems include the motor-alternator, naturally commutated inverter, forced commutated inverter, and the synchronous inverter-condenser power conditioners.

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WASHINGTON, D C 20590

METALLIZATION FAILURES
DOT–TSC–NASA–71–9
Transportation Systems Center
Accession No. N72-13390
Beatty, R.
116 p.
May 1971
Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, Beam Lead Technology.

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NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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OCCUPANT MOTION SENSORS
DOT–TSC–NHSB–71–1
Transportation Systems Center
PB–204–808
Horner, J.L.
54 p.
March 1971
Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, Transducers.

For primary bibliographic entry, see Field 9.

DEVELOPMENT OF ANTICIPATORY AUTOMOBILE CRASH SENSORS
DOT–TSC–NHTSA–71–3
Transportation Systems Center
PB–204–806
Hopkins, Holmstrom, Apgar, Hazel, White, and Newfell

June 30, 1971
Automobile Safety, Occupant Protection, Passive Restraint Activation, Anticipatory Crash Sensing.

A comprehensive examination is carried out to determine the basic system constraints and required operational characteristics for anticipatory sensing of impending automobile crashes. This is followed by consideration of a wide variety of possible sensing techniques and selection of those deserving of further study. Two methods are chosen, microwave radar and ultrasonic sonar, and the advantages, weaknesses, and uncertain areas of both are delineated.

Realization of both sensors is described. The radar sensor, comprising standard microwave components and solid state circuitry, has been installed on a test vehicle for characterization. Results are promising, but preliminary; the complexity of the sensing task and the reliability demands on the system require extensive analysis and testing before a conclusion can be drawn as to overall viability.

The sonar approach is a translation of the radar sensor into acoustic form. Transducers have been the subject of particular study and modification. Preliminary results suggest that environmental considerations and adequate target discrimination will be the major problem areas.

OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS
DOT–TSC–NHTSA–71–4
Transportation Systems Center
PB–204–809
Horner, J.L., Ofsevit, D.S., Plant, G.R., Lawrence, G.G.
55 p.

Bandwidth, Rotational Motion, Fourier Analysis, Sensor, Transducer, Acceleration, Angular Motion, Digital Filtering.

For primary bibliographic entry, see Field 9.

EXHAUST-SYSTEM LEAK TEST: QUANTITATIVE PROCEDURE
DOT–TSC–NHTSA–72–10
Transportation Systems Center

Klaubert, E.C.
110 p.
June 1973
Leak Test, Exhaust System, Automotive, Inspection Safety, Orifice Flowmeter.

A quantitative, periodic motor vehicle safety-inspection test for determining the leakage rate of engine exhaust from an automotive exhaust system was investigated. Two technical approaches were evaluated, and the better one was selected for development of necessary special equipment and test procedures. The results of the measurement are expressed as the diameter of a single round hole, equivalent in leakage rate to the sum of all leaks in the exhaust system being tested. This method is capable of measuring leaks equivalent in size down to about a 1/16-inch hole; discrimination between leaks of 1/8-to 1/2-inch diameter is reliable and easily achieved. Total time to conduct a test and evaluate results is estimated to be from 2 to 5 minutes. In addition, the test imposes a reproducible pressure stress on each system tested; this provides reasonable assurance that the system will remain structurally intact until the next inspection period without developing catastrophic leakage. A field test kit has been developed which can accommodate engine displacements to 460 cubic inches. Flow calibration data are given. A detailed test procedure complete with leak-size determination graphs and a calculation nomograph is presented in an appendix.

OFFICE OF THE SECRETARY OF TRANSPORTATION
WASHINGTON, D C 20590

VEHICULAR TRAFFIC FLOW THEORY AND TUNNEL TRAFFIC FLOW MEASUREMENTS
DOT–TSC–OST–71–7
Transportation Systems Center
Accession No. PB-204798
Chin, G., Jordan, L., Kahn, D., Morin, S., Yoh, P.
221 p.
June 1971
Traffic Flow, Tunnel Traffic, Congestion, Airport Access.

For primary bibliographic entry, see Field 5.

MODELING TRANSPORTATION SYSTEMS: AN OVERVIEW
DOT–TSC–OST–71–9
Transportation Systems Center
Accession No. PB-213123
Kovatch, G., Zames, G.

June 1971
Transportation Modeling, Transportation Planning.

For primary bibliographic entry, see Field 5.

TRANSPORTATION SYSTEMS TECHNOLOGY: A TWENTY-YEAR OUTLOOK
DOT–TSC–OST–71–10
Transportation Systems Center
Accession No. PB-204800
Kovatch, G., Barber, J.B., Casey, R.F., Zames, G.

August 1, 1971
Transportation Technology, Urban Transportation, Interurban Transportation.

In this report an overall technology assessment of new and improved transportation systems is given. A broad survey has been made of new systems concepts for passenger and freight transportation in urban and interurban applications. Results of the findings are reported and projections of expected innovations and improvements are made along with discussion of some of the major limitations to wide scale applications over the next two decades. Recommendations for research and development emphasis in some of the more promising areas are given where possible although full analysis of cost factors and comparative analysis of competing systems were beyond the scope of this investigation.

PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST ANALYSIS
DOT–TSC–OST–71–11
Transportation Systems Center
Accession No. PB-204801
Kovatch, G., Zames, G.

August 1, 1971
Transportation Systems Analysis, PRT Systems, Urban Transportation.

For primary bibliographic entry, see Field 5.

ALTERNATIVE DUAL MODE NETWORK CONTROL STRATEGIES
DOT–TSC–OST–72–10
Transportation Systems Center
Accession No. PB-211957
Kangas, R.D.
29 p.
March 1972
Automatic Vehicle, Network Control.

From a literature survey a qualitative evaluation was made of four netwrok control strategies for the fundamental control philosophy of the moving synchronous slot. In the literature concerning automated transportation systems, such as dual mode, a great deal of effort has been expended in discussing the pros and sometimes the cons of a specific control concept without reviewing other control strategies that may be available. This paper summarizes the major advantages and disadvantages associated with four control strategies for the moving synchronous slot. A description of each of these control strategies is provided and conclusions are made showing that the deterministic slot/cycle concept and the quasi-synchronous slot concept with entrance station throughput modulated by historic demand data are the most promising. Additional investigations of these two concepts showed that a further study of alternative network control strategies is needed, oriented towards addressing the issues of network capacity, interchange design, passenger convenience and system failure and recovery.

ANALYSIS AND COMPARISION OF SOME AUTOMATIC VEHICLE MONITORING SYSTEMS
DOT–TSC–OST–72–32
Transportation Systems Center

Buck, R., Esposito, R., Unkauf, M.
72 p.
July 1973
Automatic Vehicle Monitoring.

In 1970 UMTA solicited proposals and selected four companies to develop systems to demonstrate the feasibility of different AVM techniques. The demonstrations culminated in experiments in Philadelphia to assess the performance capabilities of each system. The purpose of this report is to analyze and compare those different AVM systems and to answer some specific questions that appear on the FCC Docket No. 18302. These questions are on the performance comparisons of the AVM systems with respect to accuracy, bandwidth, update rate, and data transmission capability. In addition some general considerations on the different AVM systems have been made with respect to performance.

ANALYSIS OF DUAL MODE SYSTEMS IN AN URBAN AREA VOLUME I: SUMMARY
DOT–TSC–OST–73–16
Transportation Systems Center

Benjamin, P., Barber, J., Favout, R., Goeddel, D., Heaton, C., Kangas, R., Paules, G., Roberts, E., Vance, L.
40 p.
April 1973
Urban Transportation Systems, Dual Mode Systems.

Various forms of Dual Mode transportation were analyzed in order to determine the economic viability of the Dual Mode concept. Specially designed new small Dual Mode vehicles, modifications of existing automobiles, and pallet systems, all operating in conjunction with Dual Mode buses, were examined. The study was conducted in a Boston 1990 scenario, in which an extensive Dual Mode system providing service for the entire urban region was presumed to exist. This study was not intended to be a proposal for Dual Mode in Boston. The following conclusions are considered to be generally applicable to other large urban areas as well: (a) Dual Mode systems appear to be sufficiently attractive to warrant further technological development; (b) for urban-wide applications, a Dual Mode system which includes both buses and personal vehicles is more effective than one consisting of either fleet of vehicles alone; (c) a Dual Mode transportation system benefits from the use of various Dual Mode concepts throughout its development. An effective first step would be to install a limited network Dual Mode minibus system, with capacity for ultimate growth to a longer guideway network with personal vehicles and buses.

DEVELOPMENT OF METHODS FOR PREDICTING AIR-LOADS ON TACV CONFIGURATIONS DUE TO STRONG CROSS-WIND GUSTS
DOT–TSC–171–1
Kaman AviDyne

Ruetenik, J.R., Zartarian, G.
106 p.
March 27, 1972
Tracked Air Cushion Vehicles, Crosswinds, Gust Loadings.

Equations for predicting the transient side force and yawing moment on TACV cars due to a strong side gust are developed. The protection afforded by side rails is estimated. The equations account for transient slender-body effects and growth of vortices on the lee side. For a vehicle speed of 150 mph, the analysis indicates a side gust of 60 mph would produce a transient peak in side force of 1x the steady-state value for the first car to 4.3x for the third car. An unresolved uncertainty of a factor of two in predicting the steady-state side force on TACV models in wind-tunnel tests with a moving ground plane is attributed to flow effects between the vehicle bottom and the ground plane.

Because of questions regarding ground-plane simulation in wind-tunnel tests, effect of side rails on gust airloads, and the airloads due to passing trains, the feasibility of developing a facility for measuring forces and moments on moving models is explored. It is concluded that a laboratory facility with a 25-30 ft track for testing 1-ft length models at 100 fps would provide useful data; principal development problems would be associated with model-support vibration and model-balance measurement. A larger facility with a 120-140 ft track for testing 4-5 ft length models would provide good Reynolds-number simulation, readily met model guideway tolerance requirements and greater ease of measurement.

*** DYNAMIC BRAKING OF THE URBAN TRACKED AIR CUSHION VEHICLE**
DOT–TSC–203–2
Alexander Kusko, Inc.

Kusko, A., Knutrud, T., Cain, J.J.
61 p.
September 1971
Electric Propulsion, Electric Braking.

The linear induction motor for the Urban Tracked Air Cushion vehicle, proposed by both Rohr and LTV, will be used for dynamic braking by exciting the winding the direct current. Effective braking will be obtained using the reaction rail as the energy sink from 150 mph down to 20 to 30 mph, at which speed the mechanical brakes will be blended in. This report is a study of various concepts for implementing dynamic braking and includes a battery system, a battery chopper system, and a transformer-rectifier system. A comparison of battery-operated systems with a direct transformer-rectifier system shows that the transformer-rectifier is considerably lighter and adequate for the application. The estimated weight is 406 pounds.

LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOLUME II–INSTRUMENT SCREENING EXPERIMENTS
DOT–TSC–213–1
Guggenheim Center for Aerospace Health and Safety

McFarland, R.A., Dougherty, J.D., Arees, E.A., Gird, J.J.
204 p.
April 1973
Alcohol, Intoxication, Interlock, Intoxicated Performance, Habitual Drinker.

This report contains the results of an experimental and analytical evaluation of instruments and techniques designed to prevent an intoxicated driver from operating his automobile. The prototype "Alcohol Safety Interlock Systems" tested were developed both by private industry and by the Transportation Systems Center and were all drawn from a class of instruments which detect intoxication by measuring changes in the subjects ability to perform a psychomotor task. The final report consists of the following documents:

Volume I, Summary Report-Contains an overview and summary of all the ASIS evaluation work performed through July 1972 and the results of the evaluation. Volume I is divided between the overview and an extensive appendix.

Volume II, Instrument Screening Experiments-Contains details of the experiments conducted by the Guggenheim Center, Harvard School of Public Health, including experimental procedures, results and some preliminary data analyses.

Volume III, Instrument Performance at High BAL-Contains the results of the experimental work performed by Dunlap and Associates, Inc., covering the performance of subjects with relatively high blood alcohol levels on selected instruments.

LIGHT RAIL TRANSIT SYSTEMS–A DEFINITION AND EVALUATION
DOT–TSC–310–1
Dr. Vukan R. Vuchic

Vuchic, V.R.
128 p.
October 1972
Light Rail Transit Systems, Urban Rail, Rail Transit, Public Transportation.

Rail transit represents a family of modes ranging from light rail to regional rapid transit systems and it can be utilized in a number of different cities and types of applications.

Many European cities of medium size employ very successfully light rail mode for gradual upgrading of transit service into partially or fully separated high speed, reliable transit systems. Analysis of these cities show that with population densities and auto ownership very similar to those in the United States cities, their transit systems offer a superior service and have much better usuage than our cities.

Many modern features of light rail technology are not known in this country. Wider use of different rail systems, greatly increased transit financing, introduction of more qualified personnel into transit industry and improved transit planning and implementation procedures are recommended to close the

gap in urban transportation between some more progressive European cities and their counterparts in this country.

FIFTEEN-OH-ONE TO SIXTEEN-THIRTY TECHNICAL AND MANAGERIAL LESSONS FROM ONE EXPERIENCE IN INTRODUC-NEW TECHNOLOGY TO IMPROVE URBAN MASS TRANSPORTATION
DOT–TSC–319–1
Social Engineering Technology

Price, C.R., Scheele, D.S.
128 p.
November 1972

Acquiring 30 new, double-desk, self-propelled, electrically operated commuter rail cars numbered 1501 to 1630 is part of a five-year effort to improve service on the suburban lines in the South Chicago area operated by the Illinois Central Railroad. The introduction of the cars and other improvements represent one instance of attempts to upgrade service in an existing system. In the course of this effort, experience has been acquired that can be useful both to systems that are being altered, and to totally new systems yet to be designed and developed.

This report deals with lessons learned and the insights or new ideas that emerged which may be useful for: (1) the further development of this particular system; (2) the conception, design, and development of similar systems elsewhere; (3) stimulation of designers and related systems; and (4) the practices of managers and planners responsible for improving urban mass transit services.

AUTOMOBILE CRASH-SENSOR SIGNAL PROCESSOR
DOT–TSC–409
Burroughs Corporation Defense, Space and Special Systems Group.
100 p.
March 1973
Automobile-Crash, Crash-Sensor, Signal-Processor, Vehicle Passive Restraint System, Passenger Restraint System.

The Crash Sensor Signal Processor described interfaces between an automobile-installed doppler radar and an air bag activating solenoid or equivalent electromechanical device. The processor utilizes both digital and analog techniques to produce an output pulse when specified input signal amplitude and frequency conditions are met. The device is intended to be implemented with monolithic MOS large scale integrated circuitry and Bipolar driver. The design and reliability studies indicate that very low cost and very high reliability can be achieved concurrently by monolithic techniques without compromising Processor performance.

URBAN MASS TRANSPORTATION
ADMINSTRATION
WASHINGTON, D C 20590

BIBLIOGRAPHY ON GROUND VEHICLE COMMUNICATION & CONTROL: A KWIC INDEX
DOT–TSC–UMTA–71–3
Transportation Systems Center
Accession No. PB-204807
Thompson, W.I. III
191 p.
August 1971
Bibliography.

For primary bibliographic entry, see Field 9.

*** REPORT ON SUBWAY TUNNELING NEEDS OF 13 SELECTED U.S. CITIES, 1971 - 1975**
DOT–TSC–UMTA–72–5
Transportation Systems Center

Van Dyke, W.
38 p.
June 15, 1972
Tunnels, Subway.

This report establishes proposed subway tunneling construction needs for thirteen selected U.S. cities during 1971 - 1975 as given by the transit authorities. This information will be used to estimate the demand for subway tunnel construction. This demand estimate is an important criterion in the generation of an UMTA R&D program in tunneling. With the knowledge of the estimated demand in dollars as a function of the various types of construction, e.g., hard rock, soft ground, cut and cover, (including a breakdown of cost by function, i.e. excavation, mucking, etc.) research requirements will be established.

*** EFFECT OF FREQUENCY AND SPATIAL-HARMONICS ON ROTARY AND LINEAR INDUCTION MOTOR CHARACTERISTICS**
DOT–TSC–UMTA–72–7
Transportation Systems Center

Stickler, J. J.
58 p.
March 1972
Linear Induction Motor, Harmonic Effects, Rotary Induction Motors, Thyristor-Control, End-Effects.

A computer analysis is made of the effect of current and MMF airgap harmonics on the output characteristics of rotary and linear induction motors. The current harmonics accompanying thyristor-control operation are evaluated by Fourier analyzing the primary current waveforms. The agreement between the computed harmonic amplitudes and those measured on an equivalent Wye-connected rotary induction motor is reasonably good. The calculated torque harmonics, which are generally small compared with the fundamental torque, tend to be maximum at unity motor slip and at large thyristor hold-off angles.

The reduction in the output thrust of linear induction motors caused by end-effect waves is calculated for different values of circuit damping constant. The results indicate a considerable negative thrust contribution due to the end-effect waves in the region of small motor slip or synchronous speeds. A family of thrust-slip characteristics is presented for a typical linear induction motor illustrating the combined effect of frequency harmonics and spatial end-effect waves on the output performance of the motor.

*** ENGINEERING COST ANALYSIS OF THE URBAN-TRACKED AIR CUSHION VEHICLE SYSTEM**
DOT–TSC–UMTA–72–8
Transportation Systems Center

Hitz, J.S.
56 p.
June 1972
Computer Program, UTACV Operating Characteristics, Capital Costs, Operating Costs, Financing Requirements, Parametric Cost Analysis, Comparative Cost Analysis between UTACV, Rapid Rail, Bus & PRT.

The Urban Tracked Air Cushion Vehicle (UTACV) is presently being developed as a means of improving urban transportation. Because implementation of the UTACV into revenue service will require the commitment of large amounts of capital resources, an investigation should be made to determine the capital cost and other financial requirements involved. Accordingly, this report covers the development of a cost analysis conducted for the UTACV. The report covers the development of a computer program used for determining the costs incurred in the application of the UTACV for various hypothetical situations and for performing sensitivity analyses for the cost parameters. Specifically, based on various levels of passenger demand, the computer program determines the system operating characteristics (number of vehicles, headway, trip time, etc.), total project cost, operating costs, revenues, and requirements for debt financing. The report will also describe a modification of the original computer program to include a comparative cost analysis between the UTACV and Rapid Rail, Express Bus and Line Haul PRT systems. The systems were compared over a wide range of passenger demands and operating conditions.

DEVELOPMENT AND TESTING OF A COMPLETELY PASSIVE, AIR SUSPENDED, AIR PROPELLED PERSONAL RAPID TRANSIT VEHICLE
DOT–TSC–UMTA–73–1
Transportation Systems Center

Smoot, C. H., et al
102 p.
April 1973
PRT (Personal Rapid Transit), Air Cushion Vehicles, Passive Vehicle, Circulation and Distribution

A prototype Uniflo vehicle base with mock-up superstructure was tested on 55 ft. of full-scale track.

Sound treatment to meet NCA 60 at 25 ft. from the guideway enclosure and within the vehicle was proposed and the costs determined.

A heating and cooling system using passive vehicle heat sink elements with station berth recharging was found desirable because of its lower cost and reliability.

An evaluation of the estimated production quantity costs for the vehicle base, guideway surface, levitation and thrust elements showed a reduction of 49% compared to previous design estimates.

Extensive tests confirmed the feasibility of the track based linear air turbine used for acceleration and service braking in the Uniflo PRT system.

Ride quality measurements indicated a need for improved secondary suspension.

Emply vehicle speeds over 20 ft./sec. and accelerations exceeding 5 ft./sec.^{2} were achieved with an air flow of 72.0 ft.^{3}/sec. Vehicle starting drag was less than 5 lbs. force.

14

14. METHODS AND EQUIPMENT

Includes the following Groups: Cost Effectiveness; Laboratories, Test Facilities, and Test Equipment; Recording Devices; Reliability; Reprography.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

SURVEY OF METEOROLOGICAL REMOTE SENSORS
DOT–TSC–CG–71–1
Transportation Systems Center
Accession No. PB-204793
Barrington, A.E.

May 1971
Meteorology, Remote Sensing, Data Buoy, Instrumentation.

For primary bibliographic entry, see Field 4.

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION
DOT–TSC–CG–71–3
Transportation Systems Center
Accession No. PB-204805
Lifsitz, J.R., Ingrao, H.C.

June 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

For primary bibliographic entry, see Field 8.

AN INVESTIGATION OF OIL FLUORESCENCE AS A TECHNIQUE FOR THE REMOTE SENSING OF OIL SPILLS
TSC–USCG–71–7
DOT/Transportation Systems Center
Accession No. PB-204792
Fantasia, J.F., Hard, T.M., Ingrao, H.C.

Oil Spills, Oil, Remote Sensing, Oil Fluorescence, Laser.

For primary bibliographic entry, see Field 8.

A TECHNIQUE FOR MEASURING THE BEHAVIOR OF A NAVIGATIONAL BUOY
DOT–TSC–CG–72–1
Transportation Systems Center

Babb, L.V., Wilmarth, R.W.
118 p.
September 1971
Buoy, Behavior, Telemetry Control.

A prototype instrumentation system has been developed and fabricated to furnish stability information about a moored navigational buoy. The parameters necessary to define this stability are listed and the electro-mechanical transducers selected to measure these parameters are discussed. By utilizing a command and data transmission telemetry system, analog data were recorded and used to determine the types of instrumentation best suited to this application. A discussion of the results of testing and project recommendations conclude the report.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

ASDE-2 TRANSMITTER MODIFICATIONS
DOT–TSC–FAA–72–16
Transportation Systems Center
Accession No. AD751927
Guarino, H.R.
29 p.
September 1972

For primary bibliographic entry, see Field 1.

ALL-WEATHER-LANDING OPERATIONS BIBLIOGRAPHY
DOT–TSC–FAA–72–19
Transportation Systems Center
Accession No. AD754267
Morris, J.M.
52 p.
June 1972
Landing, All-Weather Landing, Category III Operations, Low-Visibility.

For primary bibliographic entry, see Field 1.

VORTEX SENSING TESTS AT LOGAN AND KENNEDY AIRPORTS
DOT–TSC–FAA–72–25
Transportation Systems Center
Accession No. AD-753849
Sullivan, T., Burnham, D., Kodis, R.
136 p.
December 1972
Vortex Sensing Tests, Acoustic Sensors, Wind Pressure Sensors, Aircraft Wake Vortices.

For primary bibliographic entry, see Field 1.

ELECTROCARDIOGRAM SCANNER-SYSTEM REQUIREMENTS
DOT–TSC–FAA–72–33
DOT/Transportation Systems Center
Accession No. AD-759082
Davis, P.W., Ofsevit, D., Lutz, J.
40 p.
March 1973
Electrocardiograms, Electrocardiography Scanning, Optical Scanners.

For primary bibliographic entry, see Field 6.

A METHOD FOR THE STUDY OF CATEGORY III AIRBORNE PROCEDURE RELIABILITY
DOT–TSC–FAA–72–35
Transportation Systems Center
Accession No. AD758698
Feehrer, C.E.
40 p.
March 1973
Category III Systems, All-Weather Landing, Low-Visibility Operations.

For primary bibliographic entry, see Field 1.

HUMAN FACTORS EXPERIMENTS FOR DATA LINK: INTERIM REPORT I
DOT–TSC–FAA–72–37
Transportation Systems Center
Accession No. AD754273
Hilborn, E.H.
72 p.
November 1972
Air Traffic Control, Data Link, Displays, Synthetic Speech, Message Coding, Simulators.

For primary bibliographic entry, see Field 1.

CONTROLLER-REPORTED PERFORMANCE DEFECTS IN THE AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (1971 SURVEY)
DOT–TSC–FAA–72–40
Transportation Systems Center
Accession No. AD758699
Rubinger, B.
200 p.
March 1973
Air Traffic Control, Radar Beacon System, Performance Survey, Beacon Discrepancy Reports, Controller Fault Reports, Beacon System Performance.

For primary bibliographic entry, see Field 1.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA VOLUME I
DOT–TSC–FAA–72–41
Transportation Systems Center

Kalafus, R.M., Bishop, G.J., LaRussa, F.J., Pantano, P.J., Wade, W.R., Yatsko, R.S.
246 p.
February 1973
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Microwave Sources.

For primary bibliographic entry, see Field 1.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA VOLUME II
DOT–TSC–FAA–72–41
Transportation Systems Center
Accession No. AD-755682
Kalafus, R.M., Bishop, G.J., LaRussa, F.J., Pantano, P.J., Wade, W.R., Yatsko, R.S.
206 p.
February 1973
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Microwave Sources.

For primary bibliographic entry, see Field 1.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS
DOT–TSC–FRA–71–3
U.S. Department of Transportation
Accession No. PB-204796
Hopkins, J.B., Hazel, M.E.

June 1, 1971
Grade Crossing Protection, Train Detection, Microwave Telemetry, Railroad Signals.

For primary bibliographic entry, see Field 9.

TRAIN CONTROL AND OPERATIONS
DOT–TSC–FRA–71–5
Transportation Systems Center

Hergenrother, K.
31 p.
June 1971
Automatic Train Operations, Automatic Train Control, Diesel Air Pollution.

ATO (automatic train operation) and ATC (automatic train control) systems are evaluated relative to available technology and cost-benefit. The technological evaluation shows that suitable mathematical models of the dynamics of long trains are required before substantial improvements can be made to ATO systems, and the present ATC systems are presently near optimum. The cost-benefit analysis concludes that only railroads which find CTC (centralized traffic control) economically desirable will also find that ATC offers improved operating economies. ATO does not seem economically or politically practical in the general railroad environment.

A brief evaluation is made of both the contribution of the railroad locomotive to air pollution and the possible means of controlling this pollution.

PROGRESS ON THE RAM WING CONCEPT WITH EMPHASIS ON LATERAL DYNAMICS
DOT–TSC–FRA–71–7
Transportation Systems Center

Barrows, T.M.
69 p.
June 1971
Ram Wing, Ground Effect, Lateral Dynamics.

For primary bibliographic entry, see Field 1.

***MATERIALS TEST PROGRAM, CONTACT POWER COLLECTION FOR HIGH SPEED TRACKED VEHICLES**
DOT–TSC–FRA–72–1
Transportation Systems Center

Spenny, C.H., Litant, I., Altshuler, T.
26 p.
December 1971
Power Collection, Brush Wear, High Speed Tracked Vehicles.

A test program is defined for determining the failure modes and wear characteristics for brushes used to collect electrical power from the wayside for high speed tracked vehicles. Simulation of running conditions and the necessary instrumentation for monitoring brush behavior are discussed. Techniques for laboratory characterization of materials exposed to various wear conditions are also described.

IMPROVEMENT OF METROLINER TELEPHONE CHANNEL CAPACITY AND MODELING OF TELEPHONE CHANNEL DEMANDS
DOT–TSC–FRA–72–2
Transportation Systems Center

Chin, G.Y., Eaves, R.E. Jr., Kodis, R.D., Yoh, P.
42 p.
March 1972
Mobile Telephone System, Channel Capacity, Demand Model.

The channel capacity of the present Metroliner telephone system is analyzed and methods are proposed to increase that capacity without increasing the overall bandwidth. To determine the number of channels required, calculations have been carried out using two available mathematical models: the Erlang Modal and the Waiting Model. Three criteria have been used: (1) the probability that no channel is available, (2) the mean waiting time and (3) the probability of having to wait at least t minutes.

AUTOMATIC CAR IDENTIFICATION - AN EVALUATION
DOT–TSC–FRA–72–3
Transportation Systems Center
Accession No. PB-209553
Troup, K.F. III
30 p.
March 1, 1972
ACI, Railroad Information Systems, Terminal Improvements.

In response to a Federal Railroad Administration request, the Transportation Systems Center evaluated the Automatic Car Identification System (ACI) used on the nation's railroads. The ACI scanner was found to be adequate for reliable data output while the label was found to cause most problems with ACI data accuracy. System costs are discussed with several considerations which, depending on the application, can minimize system cost. A number of effective applications of ACI are cited. In addition several reasons why system implementation has not proceeded as planned are discussed. Finally, recommended Department of Transportation actions are included.

*** AUTOMATIC CAR IDENTIFICATION - AN EVALUATION**
DOT–TSC–FRA–72–4
Transportation Systems Center

Troup, K.F. III
32 p.
March 1, 1972
ACI, Railroad Information Systems, Terminal Improvements.

In response to a Federal Railroad Administration request, the Transportation Systems Center evaluated the Automatic Car Identification System (ACI) used on the nation's railroads. The ACI scanner was found to be adequate for reliable data output while the label was found to cause most problems with ACI data accuracy. System costs are discussed with several considerations which, depending on the application, can minimize system cost. A number of effective applications of ACI are cited. In addition several reasons why system implementation has not proceeded as planned are discussed. Finally, recommended Department of Transportation actions are included.

NONCONTACT POWER COLLECTION FOR HIGH-SPEED GROUND TRANSPORTATION SYSTEMS
DOT–TSC–FRA–72–7
Transportation Systems Center

Stickler, J.J.
43 p.
July 1972
Noncontact Power Collection, Electric Arc, Inductive Coupling, Capacitive Coupling, Electromagnetic Coupling.

For primary bibliographic entry, see Field 9.

*** RAILROADS AND AIR POLLUTION: A PERSPECTIVE**
DOT–TSC–FRA–72–14
Transportation Systems Center

Sturm, J.C.
104 p.
May 1973
Railroads, Air Pollution, Emission, Diesel-Electric Locomotive.

For primary bibliographic entry, see Field 6.

*** DYNAMIC TEST PROGRAM, CONTACT POWER COLLECTION FOR HIGH SPEED TRACKED VEHICLES**
DOT–TSC–FRA–72–17
Transportation Systems Center

Spenny, C.H.
34 p.
April 1973
Power Collection, High Speed Tracked Vehicles.

For primary bibliographic entry, see Field 9.

NATIONAL HIGHWAY TRAFFIC AND SAFETY ADMINISTRATION
WASHINGTON, D C 20591

*** SUMMARY AND EVALUATION OF RESPONSES RECEIVED ON THE ALCOHOL SAFETY INTERLOCK SYSTEM**
DOT–TSC–NHTSA–71–2
Transportation Systems Center

Sussman, E. D.
25 p.
May 1971
Alcohol Intoxication Interlock Driving Psychomotor-Performance.

This report summarizes and evaluates devices and suggestions provided by respondents to the DOT Prospectus entitled "Some Considerations Related to the Development of an Alcohol Safety Interlock System (ASIS)". The responses are categorized into: (1) ASIS based on measurement of human performance, (2) ASIS based on personal or vehicle identification, and (3) ASIS based on the detection of alcohol.

EVALUATION OF LENGTH-OF-STAIN GAS INDICATOR TUBES FOR MEASURING CARBON MONOXIDE IN AIR
DOT–TSC–NHTSA–71–8
Transportation Systems Center
Accession No. PB-213437
Klaubert, E.C., Sturm, J.C.
15 p.
November 1971
Carbon Monoxide, Gas Analysis, Gas Indicator Tubes.

For primary bibliographic entry, see Field 6.

OCCUPANT MOTION SENSORS: ROTATIONAL ACCELEROMETER DEVELOPMENT
DOT–TSC–NHTSA–72–1
Transportation Systems Center
Accession No. PB-212435
Warner, A., Ofsevit, D., Plank, G.
35 p.
April 1972
Acceleration, Accelerometer, Angular, Mouthpiece, Occupant Motion, Restraint System.

For primary bibliographic entry, see Field 6.

EXPERIMENT IN ASSESSING COLOR SEPARATION TECHNIQUES FOR IDENTIFYING SMALL DENSITY VARIATIONS IN TIRES
DOT–TSC–NHTSA–72–2
Transportation Systems Center

Bobo, S.N.
17 p.
July 1972
Color Radiography, Nondestructive Testing Of Tires.

An experimental color system was tested as an adjunct to the X-ray fluoroscopy system already in use. Shades of gray were translated into various colors as a means of enhancing small defects normally observed with difficulty, and to provide for more rapid identification of gross defects.

AN INFRARED EXPERIMENT ON A ROAD WHEEL DURING AN FMVSS 109 TYPE COMPLIANCE TEST
DOT–TSC–NHTSA–72–3
Transportation Systems Center

Bobo, S.N.
36 p.
June 1972
Tire Non-Destructive Test, Non-Destructive Compliance Test, Infrared Measurement.

This report outlines an experiment conducted at a compliance center to gain information on relating a tire's thermal performance during testing, to tire failure. To substantiate this correlation, the instrumentation used is described as well as the method of data retrieval. The tires were inspected by various non-destructive tests before and after compliance testing.

The population of inspected tires was inadequate for general conclusions about the relationship between temperature and failure but the data obtained indicates the technique shows promise. The experiment found a definite relationship between the number of tires being run on a test wheel and the thermal stress applied to those tires.

HOLOGRAPHIC TECHNIQUES FOR NONDESTRUCTIVE TESTING OF TIRES
DOT–TSC–NHTSA–72–4
Transportation Systems Center

Ceccon, H.L.
64 p.
April 1972
Nondestructive Testing Of Tires, Holographic Testing Of Tires.

Holographic interferometric techniques were used in a development program to evaluate the feasibility of the technique in the nondestructive testing (NDT) of commercial automobile tires.

Passenger tires with built-in defects were holographically inspected to determine the types of tire defects that can be detected using this method. Separations and voids were located reliably. Defects other than separations and voids were detected in some cases.

A program is currently underway in which "off-the-shelf" passenger tires are first inspected holographically as well as by other NDT methods, then subjected to the Motor Vehicle Safety Standard 109 endurance or high speed tests, reholographed and then sectioned analytically. The objective of the program is to correlate nondestructive test data with tire failure.

INSTRUMENTATION DEVELOPMENT FOR DRUG DETECTION ON THE BREATH
DOT–TSC–NHTSA–72–9
Transportation Systems Center

Hobbs, J.R., Barrington, A.E.
38 p.
September 1972
Mass Spectrometry, Breath Analysis, Drug Signatures.

For primary bibliographic entry, see Field 6.

EXHAUST-SYSTEM LEAK TEST: QUANTITATIVE PROCEDURE
DOT–TSC–NHTSA–72–10
Transportation Systems Center

Klaubert, E.C.
110 p.
June 1973
Leak Test, Exhaust System, Automotive, Inspection Safety, Orifice Flowmeter.

For primary bibliographic entry, see Field 13.

FEASIBILITY OF HIGH-RESOLUTION PULSE-ECHO TECHNIQUES FOR AUTOMOBILE TIRE INSPECTION
DOT–TSC–NHTSA–72–11
Transportation Systems Center

Ryan, R.P.
80 p.
June 1973
Nondestructive Inspection, Automobile Tires, Ultrasonics.

This report presents ultrasonic A-scan reflection oscillograms and B-scan one-dimensional scanning displays for small sections of automobile tires, and for tire-like rubber and cord composite structures, using impulse excitation of 1-MHz and 5-MHz transducers. Adequate penetration and resolution are exhibited to permit depth characterization of structures and defects. Small reflections at bonding interfaces exhibit variations indicating a potential capability for detection of interface bonding anomalies in tires.

LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOLUME I–SUMMARY REPORT
DOT–TSC–NHTSA–73–3
Transportation Systems Center

Sussman, E.D., Abernethy, C.N. III
34 p.
April 1973
Alcohol, Intoxication Interlock, Intoxicated Performance, Habitual Drinker.

For primary bibliographic entry, see Field 6.

OCCUPANT MOTION SENSORS: DEVELOPMENT AND TESTING OF A PIEZORESISTIVE MOUTHPIECE ROTATIONAL ACCELEROMETER
DOT–TSC–NHTSA–73–5
Transportation Systems Center

Plank, G., Ofsevit, D., Warner, A.
42 p.
July 1973
Occupant Motion, Crash Tests, Rotational Accelerometer, Piezoresistive, Data Reduction, Photogrammetry, High-Speed Film.

A miniature piezoresistive mouthpiece rotational accelerometer has been developed to measure the angular acceleration of a head during a simulated vehicle crash. Corrections have been electronically applied to the rotational accelerometer to reduce its linear sensitivity. The device has been successfully tested in the laboratory on a high speed shake table and in the field using humans and dummies. New Techniques in photogrammetry have been developed to speed the reduction of motion picture data.

OFFICE OF THE SECRETARY
OF TRANSPORTATION
WASHINGTON, DC 20590

TRIP–THE TRANSPORTATION ROUTING AND INTERMODAL PLANNING SYSTEM: AN AID FOR TODAY'S TRAVELER
DOT–TSC–OST–71–3
Transportation Systems Center
Accession No. PB-204797
Kovatch, G., Taub, J.
35 p.
January 1971
TRIP, Computer Display Technology, Comparative Cost And Time Data.

For primary bibliographic entry, see Field 9.

A THEORY OF AIRCRAFT COLLISION AVOIDANCE SYSTEM DESIGN AND EVALUATION
DOT–TSC–OST–71–4
Transportation Systems Center

Koenke, E.J.
184 p.
March 1971
Anti-Collision System, Collision Avoidance, Air Traffic Models, Collision Detection And Avoidance, Traffic Model Formulations (Air).

For primary bibliographic entry, see Field 1.

PERSONALIZED RAPID TRANSIT SYSTEMS: A FIRST ANALYSIS
DOT–TSC–OST–71–11
Transportation Systems Center
Accession No. PB-204801
Kovatch, G., Zames, G.

August 1, 1971
Transportation Systems Analysis, PRT Systems, Urban Transportation.

For primary bibliographic entry, see Field 5.

*** TECHNICAL EVALUATION OF METAL DETECTORS FOR CONCEALED WEAPONS**
DOT–TSC–OST–71–15
Transportation Systems Center

Barrington, A.E., Frenkel, L., Landman, A.
40 p.
June 1971
Metal Detectors, Aviation Security.

This document presents a classification and technical evaluation of eighteen commercial metal detectors. The classification distinguishes two main categories, hand-held devices and walk-through installations. Six subcategories account for detector response to material and location of metallic objects concealed on a subject. The evaluation is based partly on extensive laboratory tests at TSC and partly on tests at major airports by TSC and by other government agencies. The tests demonstrated the necessity to separate passengers from their hand luggage (for separate screening) in order to minimize false alarms. The results of the evaluation are presented in four charts where the eighteen detectors are ranked in order of performance and capital cost effectiveness.

The ranking is adjusted for defined situations of high risk and low risk. Three hand-held detectors and one walk-through installation merit top ranking in all charts. A more realistic assessment of total cost effectiveness is shown to be necessary, which would be based on both the findings of this study and on technical and economic operational data.

*** AN ANALYSIS OF AIRPORT ACCESS–A METHODS REVIEW AND RESEARCH PROGRAM**
DOT–TSC–OST–71–18
Systems Concepts Directorate

Paules, G.E., Roberts, E., Schaeffer, K.H.
244 p.
October 1971
Airport Access, Modal Split, Travel Survey Demonstrations.

For primary bibliographic entry, see Field 5.

MULTI-MODAL TRANSPORTATION SYSTEM SIMULATION
DOT–TSC–OST–71–19
Transportation Systems Center
Accession No. PB-213124
Ricci, R.C., Roy, J.R.
24 p.
July 1971

A laboratory with real-time simulation capability is being developed for simulating the command and control functions related to transportation systems. The initial effort in Advanced Air Traffic Control Techniques is defining and evaluating the most effective role of controllers in future ATC systems. The present laboratory status, the simulation models and structure, and programming techniques that are being used are discussed.

*** FY71 ENGINEERING REPORT ON SURVEILLANCE TECHNIQUES FOR CIVIL AVIATION SECURITY**
DOT–TSC–OST–71–20
Transportation Systems Center

Barrington, A.E., Frenkel, L., Cline, J.E., Landman, A.
125 p.
November 1971
Metal Detectors, X-Ray Systems, Explosives Detectors.

This document discusses the work performed by the TSC task group on surveillance techniques in FY71. The principal section is devoted to the technical description, classification and evaluation of commercial metal detectors for concealed weapons. It includes an outline of operating principles, test and evaluation procedures, detailed engineering data, and installation requirements. The evaluation is based on extensive laboratory tests at TSC and on tests at major airports by TSC and other government agencies. A briefer section deals with baggage inspection devices for weapons and explosives. The effort in this area was devoted to the identification of promising commercial X-ray systems and vapor detectors ('Sniffers') In an initial survey, several X-ray inspection systems were identified, using conventional high-dosage or recently developed low-dosage radiation sources, whose characteristics are described briefly herein. The discussion of vapor detectors is confined to three techniques: mass spectrometry, gas chromatography and bioluminescence. Principles of operation are outlined briefly and typical performance data are presented.

MODERN CONTROL ASPECTS OF AUTOMATICALLY STEERED VEHICLES
DOT–TSC–OST–72–3
Transportation Systems Center
Accession No. PB-211955
Pasternack, S.
20 p.
December 1971
Automatic Steering.

In the study of automatically steered rubber tired vehicles, little emphasis in the past has been placed on the steering control laws. This report examines the control law problem from the state variable point of view and it is shown that, except for possibly one velocity, the system is both controllable and observable allowing arbitrary system dynamics. It is also shown how optimal control theory may be used to select the feedback gains in order to minimize a cost function containing the square of the vehicle lateral acceleration.

AUTOMATED GUIDEWAY NETWORK TRAFFIC MODELING
DOT–TSC–OST–72–7
Transportation Systems Center
Accession No. PB-211956
Toye, C.R.
30 p.
February 1972
Automated Guideway Modeling, Simulation, Dual Mode, Network Traffic Modeling.

In the literature concerning automated guideway transportation systems, such as dual mode, a great deal of effort has been expended on the use of deterministic reservation schemes and the problem of merging streams of vehicles. However, little attention has been focused on the problem of developing models to determine space allocation on the guideway as a function of the user service level required for satisfactory operation of the system. The problem must be addressed in the early design phase of any automative guideway system and is pertinent to site selection. This paper develops probability models and uses statistical variance analysis techniques to develop procedures which can be used to determine the required guideway space necessary to satisfy a user service level for a particular demand rate. It provides the building blocks upon which various network traffic management strategies can be developed.

The paper contains an explanation of the methodology involved, gives sample problems, and describes the simulation procedures that were employed to verify the results.

ALTERNATIVE DUAL MODE NETWORK CONTROL STRATEGIES
DOT–TSC–OST–72–10
Transportation Systems Center
Accession No. PB-211957
Kangas, R.D.
29 p.
March 1972
Automatic Vehicle, Network Control.

For primary bibliographic entry, see Field 13.

THE USE OF FAR INFRA-RED RADIATION FOR THE DETECTION OF CONCEALED METAL OBJECTS
DOT–TSC–OST–72–11
Transportation Systems Center

Scotto, M.
155 p.
November 1971
Infra-Red, Detection.

The use of infra-red radiation for the detection of concealed metal objects has been investigated both theoretically and experimentally. The investigation was divided into two phases, one which considered passive techniques, and another which involved active sources of radiation to probe the subject. Because of the limited amount of time and equipment available, only primitive systems were studied, but the results serve as a fundamental guide to the requirements of a field operational system. The results obtained show that metals concealed by clothing can definitely be detected by observing the far infra-red radiation from the region of the hidden object. This type of system has the very attractive feature of high spatial resolution, and can easily distinguish between dangerous weapons and harmless objects.

*** LABORATORY EVALUATION OF DETECTORS OF EXPLOSIVES' EFFLUENTS**
DOT–TSC–OST–72–27
Transportation Systems Center

Cline, J.E., Hobbs, J.R., Barrington, A.E.
60 p.
November 1972
Explosives Detection, Mass Spectrometer, Gas Chromatograph, Electron Capture Detector, Gas Chromatograph, Bioluminescence, Dynamite, TNT.

This document contains the classification, technical description and laboratory evaluation of five commercial detectors for explosives' effluents. It includes an outline of operating principles, test and evaluating procedures. The evaluation is based on laboratory tests at TSC, tests at Logan Airport and in another government laboratory. The five detectors are the Varian Chemical Vapor Analyzer (mass spectrometer), Franklin GNO Plasma Chromatograph, Panametrics Panatek 3000 Leak Detector (Electron Capture Detector), Hydronautics Vapor Trace Analyzer (gas chromatograph) and RPC bioluminescence detector. The descriptive and technical details of the five commercial detectors are summarized in Appendix A. The results of a novel investigation to determine the mass spectrometer signature of dynamite effluent are presented in Appendix B.

SUMMARY DATA FOR SELECTED NEW URBAN TRANSPORTATION SYSTEMS
DOT–TSC–OST–72–35
Transportation Systems Center

Casey, R.F.
152 p.
November 1972
New Urban Transportation Systems, Urban Transportation System Classification.

In this report a selected set of information is presented for the most advanced of the new, unconventional or innovative urban transportation systems. Capsulized are system and vehicle physical characteristics, performance capabilities, costs and availabilities. A functional classification was developed and each system was categorized according to type of service provided. A method for using this data in the development of transportation plans for metropolitan areas is outlined.

AIRPORT AND AIR SERVICE ACCESS
DOT–TSC–OST–73–3
Civil Engineering Systems Laboratory

de Neufville, R., Wilson, N., Moore, H. III, Gelerman, W., Landau, U., Yaney, J.
156 p.
March 1973
Airport Access, Air Service Access, Satellite Airports, Air Networks.

For primary bibliographic entry, see Field 1.

TRANSPORTATION CONTRACTORS

PWI TEST AND DEVELOPMENTAL RESOURCE UTILIZATION
DOT–TSC–188–1
Intermetrics, Incorporated
Accession No. PB-212495
Carlson, N.A., Grundy, P.A., Morth, H.R., Copps, E.M., Flanders, J.H.
228 p.
November 15, 1971
Electro-Optical PWI, Test Programs, Simulation Facilities, Evaluation Tools.

For primary bibliographic entry, see Field 1.

PWI SYSTEMS SURVEY
DOT–TSC–188–2
Intermetrics Incorporated
Accession No. PB-212496
Flanders, J.H., Grundy, P.A., Carlson, N.A.
156 p.
November 15, 1971
Pilot Warning Indicators, Collision Avoidance Systems, Annotated Bibliography, Literature Survey.

For primary bibliographic entry, see Field 1.

PRELIMINARY OPERATIONAL REQUIREMENTS AND ACCEPTABILITY CRITERIA FOR THE COOPERATIVE BREATH ANALYZER
DOT–TSC–251–1
Dunlap and Associates, Inc.
Accession No. PB-211013
Oates, J.R. Jr., Jacobs, H.H.
22 p.
September 1971
Alcohol Measurements, Alcohol Breath Testing.

For primary bibliographic entry, see Field 6.

FIELD TEST PLAN FOR EVALUATING THE COOPERATIVE BREATH ANALYZER
DOT–TSC–251–2
Dunlap and Associates, Inc.
Accession No. PB-211407
Oates, J.F. Jr., Jacobs, H.H.
48 p.
September 1971
Alcohol Measurements, Alcohol Breath Testing.

For primary bibliographic entry, see Field 6.

***METHODOLOGIES FOR ESTIMATING THE EFFECTIVENESS OF ALCOHOL SAFETY INTERLOCK SYSTEMS**
DOT–TSC–251–3
Dunlap and Associates, Inc.

Oates, J.F. Jr., McCay, R.T.
49 p.
November 1971
Alcohol Measurements, Measures Of Effectiveness.

For primary bibliographic entry, see Field 6.

LABORATORY EVALUATION OF ALCOHOL SAFETY INTERLOCK SYSTEMS, VOLUME III–INSTRUMENT PERFORMANCE AT HIGH BAL
DOT–TSC–251–4
Dunlap Associates, Inc.

Oates, J.F. Jr., McCay, R.T.
124 p.
April 1973
Alcohol, Intoxication, Interlock, Intoxicated Performance, Habitual Drinker.

For primary bibliographic entry, see Field 6.

15

LIGHT RAIL TRANSIT SYSTEMS–A DEFINITION AND EVALUATION
DOT–TSC–310–1
Dr. Vukan R. Vuchic

Vuchic, V.R.
128 p.
October 1972
Light Rail Transit Systems, Urban Rail, Rail Transit, Public Transportation.

For primary bibliographic entry, see Field 13.

*** AN INTRODUCTION TO RAILROAD OPERATIONS**
DOT–TSC–PR–TI–5732–1
Wilfred H. Holland

Holland, W.H.
62 p.
June 1972
Railroad Operations, Management Organization, Train, Locomotive, Engineman.

This report provides an overview of railroad operations as a guide for consultants and contractors unfamiliar with railroading. It includes definitions of railroad terms, a description of a typical railroad management organization, discussion of regulatory bodies and labor relations, and a detailed description of train operations, including signals, brake systems, locomotives, yard and freight operations, and the duties of the engineman.

URBAN MASS TRANSPORTATION
ADMINISTRATION
WASHINGTON, D C 20590

NOISE LEVEL MEASUREMENTS ON THE UMTA MARK I DIAGNOSTIC CAR (R42 MODEL)
DOT–TSC–UMTA–72–3
Transportation Systems Center (TSC)

Rickley, E.J., Quinn, R., Byron, G.
100 p.
October 1971
Noise Abatement, Transportation Noise, Mass Transit Cars.

The R42 Model mass transit car currently operating on the "N" line of the New York City Transit System was selected for experimentation and tests. For this purpose, the car was instrumented and designated as the UMTA Mark I Diagnostic Car.

Noise levels generated by "stop and go" operations of the Diagnostic Car were measured and tabulated in this report. Measurements were made inside of and outside the car during operation on the "N" line of the New York Transit System and during operation at the DOT High Speed Ground Test Center at Pueblo, Colorado.

The report contains tabulations of the noise levels measured, time history charts, 1/3-octave frequency analyses and pertinent comments on the information obtained.

15. MILITARY SCIENCES

NO REPORTS

16

16. MISSILE TECHNOLOGY

NO REPORTS

17

17. NAVIGATION, COMMUNICATIONS, DETECTION AND COUNTER-MEASURES

Includes the following Groups: Acoustic Detection; Communications; Direction Finding; Electromagnetic and Acoustic Countermeasures; Infrared and Ultraviolet Detection; Magnetic Detection; Navigation and Guidance; Optical Detection; Radar Detection; Seismic Detection.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION
DOT-TSC-CG-71-3
Transportation Systems Center
Accession No. PB-204805
Lifsitz, J.R., Ingrao, H.C.

June 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

For primary bibliographic entry, see Field 8.

AN INVESTIGATION OF OIL FLUORESCENCE AS A TECHNIQUE FOR THE REMOTE SENSING OF OIL SPILLS
TSC-USCG-71-7
DOT/Transportation Systems Center
Accession No. PB-204792
Fantasia, J.F., Hard, T.M., Ingrao, H.C.

Oil Spills, Oil, Remote Sensing, Oil Fluorescence, Laser.

For primary bibliographic entry, see Field 8.

A TECHNIQUE FOR MEASURING THE BEHAVIOR OF A NAVIGATIONAL BUOY
DOT-TSC-CG-72-1
Transportation Systems Center

Babb, L.V., Wilmarth, R.W.
118 p.
September 1971
Buoy, Behavior, Telemetry Control.

For primary bibliographic entry, see Field 14.

FOG BANK DETECTOR FIELD TESTS: A TECHNICAL SUMMARY
DOT-TSC-USCG-72-2
Transportation Systems Center

Lifsitz, J.R., Yaffee, M.Y.
36 p.
December 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

For primary bibliographic entry, see Field 8.

***FOG BANK DETECTION SYSTEM ENGINEERING REQUIREMENTS AND TECHNICAL CONSIDERATIONS REQUIRED FOR A PERFORMANCE SPECIFICATION**
DOT-TSC-USCG-72-6
Transportation Systems Center

Lifsitz, J.R., Ingrao, H.C.
42 p.
April 1973
LIDAR, Fog Detection, Coast Guard.

For primary bibliographic entry, see Field 8.

FEDERAL AVIATION ADMINISTRATION
WASHINGTON, D C 20590

***HUMAN FACTORS IN COCKPIT INPUT AND DISPLAY FOR DATA LINK**
DOT-TSC-FAA-71-2
Transportation Systems Center

Hilborn, E.H.
18 p.
January 1971
Data Link, Air-Ground-Air Messages, ARINC Proposal, Vocabulary Messages, Display Problems.

For primary bibliographic entry, see Field 1.

THE IMPACT OF INERTIAL NAVIGATION ON AIR SAFETY
DOT-TSC-FAA-71-5
Transportation Systems Center
Accession No. AD733753
Hershkowitz, R.M., O'Mathuna, D., Britting, K.R.
25 p.
May 1971
Inertial Navigation, Collision Risk Model, En Route Navigation Statistics, Blunders.

For primary bibliographic entry, see Field 1.

COLLISION RISK MODEL FOR NAT REGION
DOT-TSC-FAA-71-6
Transportation Systems Center
Accession No. AD733754
Hershkowitz, R.
55 p.
May 1971
Collision Risk Model, Composite Problem, Vertical Separation, Lateral Separation.

For primary bibliographic entry, see Field 1.

EVALUATION OF AIR TRAFFIC CONTROL MODELS AND SIMULATIONS
DOT-TSC-FAA-71-7
Transportation Systems Center
Accession No. AD733755
Higgins, L.O., Mpontsikaris, P.

June 1971
Air Traffic Control (ATC), Modeling And Simulation Of ATC, Evaluation Of ATC Models.

For primary bibliographic entry, see Field 1.

FINAL REPORT: OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 71
DOT–TSC–FAA–71–13
Transportation Systems Center
Accession No. AD733758
Hershkowitz, R.M.

June 1971
Air Traffic Control, Collision Risk Model Inertial Navigation, Separation Standards Surveillance

For primary bibliographic entry, see Field 1.

LARGE SCALE SYSTEMS-A STUDY OF COMPUTER ORGANIZATIONS FOR AIR TRAFFIC CONTROL APPLICATIONS
DOT–TSC–FAA–71–15
DOT/Transportation Systems Center
Accession No. AD733759
Dumanian, J., Clapp, D.
152 p.
June 15, 1971
Computers, NAS Stage A Data Processing, ARTS III Data Processing.

For primary bibliographic entry, see Field 1.

SYSTEM RELIABILITY AND RECOVERY
DOT–TSC–FAA–71–16
DOT/Transportation Systems Center
Accession No. AD733760
Dancy, C.A. III
61 p.
June 15, 1971
Reliability, Recovery, Reconfiguration, Multiprocessor, Fail-safe/Soft.

For primary bibliographic entry, see Field 1.

TIME/FREQUENCY SYSTEMS
DOT–TSC–FAA–71–17
Transportation Systems Center
Accession No. AD733761
Farr, E.H., Frasco, L.A., Goldfein, H.D., Snow, R.M.
82 p.
June 30, 1971
Time/Frequency, Multipath, ATC Systems, Coding.

For primary bibliographic entry, see Field 1.

PROPOSED CONTROL TOWER AND COCKPIT VISIBILITY READOUTS BASED ON AN AIRPORT-AIRCRAFT INFORMATION FLOW SYSTEM
DOT–TSC–FAA–71–18
Transportation Systems Center
Accession No. AD-744718
Ingrao, H.C., Lifsitz, J.R.
43 p.
July 1971
Visibility, Air Traffic Control, Cockpit Display.

For primary bibliographic entry, see Field 1.

CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM
DOT–TSC–FAA–71–19
DOT/Transportation Systems Center
Accession No. AD733762
Wagner, G.W., Haroules, G.G., Brown, W.E.
47 p.
July 1971
Radiometer.

For primary bibliographic entry, see Field 1.

DISPERSED PROCESSING FOR ATC
DOT–TSC–FAA–71–20
DOT/Transportation Systems Center
Accession No. AD733763
Paul, G.G., Snow, R.M.
16 p.
June 30, 1971
Dispersed Processing, Air Traffic Control, Remote Tracking, Data Link, Intermittent Positive Control, Discrete Addressing.

For primary bibliographic entry, see Field 1.

KEYBOARD AND MESSAGE EVALUATION FOR COCKPIT INPUT TO DATA LINK
DOT–TSC–FAA–71–21
Transportation Systems Center
Accession No. AD744721
Hilborn, E.H.
38 p.
November 1971
Data Link, Air Traffic Control, Message Coding.

For primary bibliographic entry, see Field 1.

* **ATCRBS IMPROVEMENT PHASE A FINAL REPORT**
DOT–TSC–FAA–71–22
Office of Technology Transport. Sys. Ctr.

Waetjen, R.M., MacKenzie, F.D., Stein, H., Lovecchio, J.A., Kleiman, L.A.

ATCRBS/Air Traffic Control Monopulse/ATCRBS Improvement Study/ATCRBS Modification.

For primary bibliographic entry, see Field 1.

AN INVESTIGATION OF MICROWAVE LANDING GUIDANCE SYSTEM SIGNAL REQUIREMENTS FOR CONVENTIONALLY EQUIPPED CIVILIAN AIRCRAFT
DOT–TSC–FAA–71–24
DOT/Transportation Systems Center
Accession No. AD737339
Lanman, M.H. III
171 p.
June 1971
Microwave Landing System, Landing Guidance System, Scanning Rate, Scanning Beam ILS.

For primary bibliographic entry, see Field 1.

VISIBILITY CONCEPTS AND MEASUREMENT TECHNIQUES FOR AVIATION PURPOSES
DOT–TSC–FAA–71–25
Transportation Systems Center
Accession No. AD744688
Schappert, G.T.
104 p.
July 1971
Visibility, Runway Visual Range, Atmospheric Transmission, LIDAR.

For primary bibliographic entry, see Field 1.

ACCURATE SURVEILLANCE IN THE TERMINAL AREA
DOT–TSC–FAA–71–26
Transportation Systems Center
Accession No. AD-749907
Kulke, B., Minkoff, R.T., Haroules, G.G.
43 p.
September 1971
Approach Surveillance, Air-Derived Data, Parallel-Runway Spacing.

For primary bibliographic entry, see Field 1.

THE CALCULATION OF AIRCRAFT COLLISION PROBABILITIES
DOT–TSC–FAA–71–27
Transportation Systems Center
Accession No. AD744722
Bellantoni, J.F.
41 p.
October 1971
Collision, Collision Probability, Air Traffic Control, Safety.

For primary bibliographic entry, see Field 1.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA
DOT–TSC–FAA–71–29
Transportation Systems Center
Accession No. AD737511
Kalafus, R.M., Bishop, G.J., Haroules, G.G.
312 p.
September 1971
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Planar Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Propagation, Microwave Sources.

For primary bibliographic entry, see Field 1.

MULTIBEAM AERONAUTICAL SATELLITE SYSTEM DESIGN
DOT–TSC–FAA–71–30
Transportation Systems Center
Accession No. AD744861
Keane, L.M.
76 p.
December 1971
Satellite, Aeronautical, Aerosat.

A method is described which allows the identification of favored beam distributions for multiple beam aeronautical satellites. It is used to synthesize beam designs and compare the capacities of two satellite system configurations which cover the major Pacific routes. The first configuration has two satellites with eclipse capability adequate for housekeeping and independent aircraft surveillance; the second has additional battery capacity to provide 50% of the daylight communications capability in each satellite during eclipse. In this case, each satellite covers a limited portion of the full coverage area.

CHARACTERISTICS OF A SIGNAL DATA CONVERTER FOR A MULTI-RUNWAY VISIBILITY MEASURING SYSTEM
DOT–TSC–FAA–72–1
Transportation Systems Center
Accession No. AD744873
Ingrao, H.C., Lifsitz, J.R.
30 p.
October 1971
Visibility, Air Traffic Control, Signal Data Converter.

For primary bibliographic entry, see Field 1.

VORTEX SENSING TESTS AT NAFEC
DOT–TSC–FAA–72–2
Transportation Systems Center
Accession No. AD-749908
Burnham, D., Hallock, J., Kodis, R., Sullivan, T.
72 p.
January 1972
Vortex, Acoustic, Sensor, Pressure.

For primary bibliographic entry, see Field 1.

ATC OPERATIONAL ERROR ANALYSIS
DOT–TSC–FAA–72–3
Transportation Systems Center

Hynes, R.J.
8 p.
January 1972
ATC, Blunders, Human Errors, Operational Errors.

For primary bibliographic entry, see Field 1.

PATH CHANGING METHODS APPLIED TO THE 4-D GUIDANCE OF STOL AIRCRAFT
DOT–TSC–FAA–72–5
Transportation Systems Center
Accession No. AD-74874
Hynes, R.J., Capen, E.B., Stevenson, L.E.
42 p.
November 1971
4-D Guidance, Flight Path Planning, Steering Laws.

For primary bibliographic entry, see Field 1.

MONOPULSE AZIMUTH MEASUREMENT IN THE ATC RADAR BEACON SYSTEM
DOT–TSC–FAA–72–6
Transportation Systems Center
Accession No. AD-746943
Kulke, B., Rubinger, B., Haroules, G.G.
121 p.
December 1971
ATC Radar Beacon System, Monopulse Azimuth Measurement, Error Analysis, Sum-Difference Techniques.

For primary bibliographic entry, see Field 1.

THE ILS SCATTERING PROBLEM AND SIGNAL DETECTION MODEL
DOT–TSC–FAA–72–7
Transportation Systems Center
Accession No. AD746944
Chin, G., Jordan, L., Kahn, D.
105 p.
February 1972
ILS, Scattering Theory, Current Deviation Indication, Derogation, Receiver Model, Doppler Shift, DDM.

For primary bibliographic entry, see Field 1.

MODULATION AND CODING FOR A COMPATIBLE DISCRETE ADDRESS BEACON SYSTEM
DOT–TSC–FAA–72–12
Transportation Systems Center

Goldfein, H.D., Frasco, L.A.
45 p.
February 1972
DABS, ATGRBS, Modulation, Coding, Control Algorithms.

For primary bibliographic entry, see Field 1.

ALL-WEATHER-LANDING OPERATIONS BIBLIOGRAPHY
DOT–TSC–FAA–72–19
Transportation Systems Center
Accession No. AD754267
Morris, J.M.
52 p.
June 1972
Landing, All-Weather Landing, Category III Operations, Low-Visibility.

For primary bibliographic entry, see Field 1.

VORTEX SENSING TESTS AT LOGAN AND KENNEDY AIRPORTS
DOT–TSC–FAA–72–25
Transportation Systems Center
Accession No. AD-753849
Sullivan, T., Burnham, D., Kodis, R.
136 p.
December 1972
Vortex Sensing Tests, Acoustic Sensors, Wind Pressure Sensors, Aircraft Wake Vortices.

For primary bibliographic entry, see Field 1.

OCEANIC SURVEILLANCE AND NAVIGATION ANALYSIS, FY 72
DOT–TSC–FAA–72–26
Transportation Systems Center
Accession No. AD757274
Gagne, G.A., Hershkowitz, R.M.
76 p.
August 1972
Air Traffic Control, Collision Risk Model, Hybrid-Inertial Navigation, Satellite Surveillance, Latitude, Vertical, Longitudinal Separation.

For primary bibliographic entry, see Field 8.

INSTRUMENT LANDING SYSTEM SCATTERING
DOT–TSC–FAA–72–28
Transportation Systems Center
Accession No. AD754517
Chin, G., Jordan, L., Kahn, D., Morin, S.
148 p.
December 1972
ILS, Scattering Theory, Current Deviation Indication, Derogation, Receiver Model, Doppler Shift, DDM.

For primary bibliographic entry, see Field 1.

MICROWAVE LANDING SYSTEM SIGNAL REQUIREMENTS FOR CONVENTIONAL AIRCRAFT
DOT–TSC–FAA–72–30
Transportation Systems Center
Accession No. AD754892
Lanman, M.H. III
146 p.
July 1972
Microwave Landing System, MLS, All Weather Landing, Automatic Landing.

For primary bibliographic entry, see Field 1.

A SYSTEM OF SIXTEEN SYNCHRONOUS SATELLITES FOR WORLDWIDE NAVIGATION AND SURVEILLANCE
DOT–TSC–FAA–72–31
Transportation Systems Center
Accession No. AD757807
Morrison, J.J.
62 p.
March 1973
Navigation, Surveillance, Satellite Coverage, Satellite Constellations, Global Coverage, Icosahedron.

This report considers the orbital mechanics aspects of a system of satellites to be used for position determination of any point on or near the surface of the earth. Only satellites having a period of twenty-four hours are examined. No perturbing forces are taken into account. Three and four satellites are required to be visible at twenty and ten degrees elevation angles respectively. A system of sixteen satellites is described which has the required properties.

O'HARE ASDE-2 RADOME PERFORMANCE IN RAIN; ANALYSIS AND IMPROVEMENT
DOT–TSC–FAA–72–32
Transportation Systems Center
Accession No. AD-757744
Weigand, R.M.
80 p.
March 1973
Radome, ASDE-2, O'Hare.

For primary bibliographic entry, see Field 1.

CLEAR AIR TURBULENCE RADIOMETRIC DETECTION PROGRAM
DOT–TSC–FAA–72–38
Transportation Systems Center
Accession No. AD757074
Wagner, G.W., Haroules, G.G., Brown, W.E.
94 p.
February 1973
Clear Air Turbulence Radiometer.

For primary bibliographic entry, see Field 1.

CONTROLLER-REPORTED PERFORMANCE DEFECTS IN THE AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (1971 SURVEY)
DOT–TSC–FAA–72–40
Transportation Systems Center
Accession No. AD758699
Rubinger, B.
200 p.
March 1973
Air Traffic Control, Radar Beacon System, Performance Survey, Beacon Discrepancy Reports, Controller Fault Reports, Beacon System Performance.

For primary bibliographic entry, see Field 1.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA VOLUME II
DOT–TSC–FAA–72–41
Transportation Svstems Center
Accession No. AD-755682
Kalafus, R.M., Bishop, G.J., LaRussa, F.J., Pantano, P.J., Wade, W.R., Yatsko, R.S.
206 p.
February 1973
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Microwave Sources.

For primary bibliographic entry, see Field 1.

MICROWAVE SCANNING BEAM APPROACH AND LANDING SYSTEM PHASED ARRAY ANTENNA VOLUME I
DOT–TSC–FAA–72–41
Transportation Systems Center
Accession No. AD-755682
Kalafus, R.M., Bishop, G.J., LaRussa, F.J., Pantano, P.J., Wade, W.R., Yatsko, R.S.
246 p.
February 1973
Aircraft Guidance, Cylindrical Arrays, Linear Arrays, Air Traffic Control, C-Band, Components, Stripline, Microstrip, Microwave Sources.

For primary bibliographic entry, see Field 1.

HUMAN FACTORS EXPERIMENTS FOR DATA LINK INTERIM REPORT NO. 2
DOT–TSC–FAA–73–6
Transportation Systems Center
Accession No. AD-760401
Hilborn, E.H., Devanna, L.R.
46 p.
April 1973
Air Traffic Control, Data Link, Message Coding.

For primary bibliographic entry, see Field 1.

A PRELIMINARY REQUIREMENTS ANALYSIS FOR AIRPORT SURFACE TRAFFIC CONTROL SYSTEMS
FAA–RD–73–6
The MITRE Corporation

Baran, G., Bales, R.A., Koetsch, J.F., Le Van, R.E.
192 p.
January 1973
Airport Surface Traffic Control, Airport Capacity, Air Traffic Control.

For primary bibliographic entry, see Field 1.

FEASIBILITY ANALYSIS OF AN AIR TRAFFIC CONTROL RADAR BEACON SYSTEM (ATCRBS) BASED SURFACE TRILATERATION SURVEILLANCE SYSTEM
FAA–RD–73–75
The MITRE Corporation

Vinatieri, J.D.
238 p.
June 1973
ATCRBS, ASDE, Ground Surveillance.

For primary bibliographic entry, see Field 1.

***PERFORMANCE PREDICTIONS FOR A PARABOLIC LOCALIZER ANTENNA ON RUNWAY 28R–SAN FRANCISCO AIRPORT**
FAA–RD–73–81
Transportation Systems Center

Jordan, L., Kahn, D., Lam, S., Morin, S., Newsom, D.
27 p.
June 1973
Instrument Landing Systems, Localizer Systems, Parabolic Antennas, Course Derogation.

For primary bibliographic entry, see Field 1.

FEDERAL HIGHWAY ADMINISTRATION
WASHINGTON, D C 20590

FREEWAY TRAFFIC FLOW FOLLOWING A LANE BLOCKAGE
DOT–TSC–FHWA–73–1
Transportation Systems Center

Kahn, D., Mintz, R.
60 p.
January 1973
Traffic Flow, Discontinuity, Shock Wave, Lane Blockage, Propagation.

The theory of traffic flow following a lane blockage on a multi-lane freeway has been developed. Numerical results have been obtained and are presented both for the steady state case where the traffic density remains constant and the non-steady state case where the traffic density changes with time.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D.C. 20590

TECHNOLOGICAL INNOVATION IN GRADE CROSSING PROTECTIVE SYSTEMS
DOT–TSC–FRA–71–3
U.S. Department of Transportation
Accession No. PB-204796
Hopkins, J.B., Hazel, M.E.

June 1, 1971
Grade Crossing Protection, Train Detection, Microwave Telemetry, Railroad Signals.

For primary bibliographic entry, see Field 9.

COMMUNICATIONS FOR HIGH SPEED GROUND TRANSPORTATION
DOT–TSC–FRA–71–8
Transportation Systems Center
Accession No. PB-212745
Chin, G.,Eaves, R., Frenkel, L., Kodis, R.
62 p.
November 15, 1971

This report is an account of investigations and analyses undertaken for the OHSGT, beginning in July of 1970, which relate to communications systems for high speed ground vehicles. The authorized scope of the effort was at the rate of one man-year. The first task undertaken was a survey of work

carried out by OHSGT contractors and others since 1968. Subsequently, specific aspects of the problem were explored in greater detail, and reports were prepared on the following:

- *(a) Mechanical Properties of Long Rigid Lines. (Section 2)*
- *(b) Electromagnetic Properties of Surface Wave Couplers (Section 3).*
- *(c) Electromagnetic Properties of Bends in Surface Wave Lines (Section 4).*
- *(d) Propagation Properties of a Trench Line (Section 5).*
- *(e) Pulse Code Modulation for Long Line Communications (Section 6).*

IMPROVEMENT OF METROLINER TELEPHONE CHANNEL CAPACITY AND MODELING OF TELEPHONE CHANNEL DEMANDS
DOT–TSC–FRA–72–2
Transportation Systems Center

Chin, G.Y., Eaves, R.E. Jr., Kodis, R.D., Yoh, P.
42 p.
March 1972
Mobile Telephone System, Channel Capacity, Demand Model.

For primary bibliographic entry, see Field 14.

PULSE TRANSMISSION OVER DISPERSIVE WAVEGUIDES IN RAILROAD COMMUNICATIONS: SOFTWARE FOR COMPUTER SIMULATION
DOT–TSC–FRA–72–11
Transportation Systems Center

Eaves, R.E.
60 p.
July 1973
Railroad Trains, Communications, Electromagnetic, Electromagnetic Wave Transmission, Distortion, Signal Wave Dispersion, Transmission.

For primary bibliographic entry, see Field 9.

* **SURVEY OF METROLINER TELEPHONE USERS AND COMPUTER PROGRAMS FOR ANALYZING TELEPHONE CHANNEL CAPACITY AND LOADING**
DOT–TSC–FRA–73–5
Transportation Systems Center

Chin, G.Y., Eaves, R.E., Yoh, P.
58 p.
July 1973
Railway Communication, Telephone-Channel Capacity.

For primary bibliographic entry, see Field 9.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON, D C 20590

EARTH SURVEY BIBLIOGRAPHY: A KWIC INDEX OF REMOTE SENSING INFORMATION
DOT–TSC–NASA–70–1
Transportation Systems Center
Accession No. N71-26398
Thompson, W.I. III
265 p.
February 1971
Earth Resources, Infrared Radar, Visible, Microwaves.

For primary bibliographic entry, see Field 8.

ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 KHZ (100 KM) - 3,000 THZ (0.1 μM)
DOT–TSC–NASA–71–6
Transportation Systems Center
Accession No. N71-20121
Thompson, W.I. III
300 p.
February 1971
Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, Ultraviolet.

For primary bibliographic entry, see Field 4.

LABORATORY EVALUATION OF FECKER AND LORAL OPTICAL IR PWI SYSTEMS
DOT–TSC–NASA–71–5
Transportation Systems Center
Accession No. N71-13351
Gorstein, M., Hallock, J.N., Houten, M., McWilliams, I.G.
81 p.
February 1971
Electro-Optical PWI, Flashing Xenon Strobe, Fault Correction, Calibrate In Azimuth Elevation And Range.

For primary bibliographic entry, see Field 1.

MULTI-SENSOR NAVIGATION SYSTEM DESIGN
DOT–TSC–NASA–71–8
Transportation Systems Center

Downing, D.R.
138 p.
March 1971
Multi-Sensor Navigation Systems, Design Procedure, Design Option, System Evaluation.

This report treats the design of navigation systems that collect data from two or more on-board measurement subsystems and process this data in an on-board computer. Such systems are called Multi-Sensor Navigation Systems.

The design begins with the definition of the design requirements and a list of n sensors and c computers. A Design Procedure is then developed which automatically performs a systematic evaluation of the (2^n-1) x c candidate systems that may be formed. This procedure makes use of a model of the navigation system that includes sensor measurement errors and geometry, sensor sampling limits, data processing constraints, relative computer loading, and environmental disturbances. The performance of the system is determined by its terminal navigation uncertainty and dollar cost. The Design Procedure consists of three design options, three levels of evaluation, and a set of auxiliary data. By choosing from among the design options and the auxiliary data, the designer can tailor the Design Procedure to his particular application.

A design option is developed to answer each of the following questions: (1) Which candidate system meets the system accuracy specification and has the lowest system cost? (2) For each sensor or computer chain, which is defined as the set of all systems containing that component, what is the system that satisfies the accuracy requirements and has the lowest cost? (3) Which systems satisfy the design accuracy requirements?

The system evaluation is accomplished using one optimal and two non-optimal techniques. The optimal performance evaluation uses the measurement schedule that minimizes the terminal uncertainty. A first-order optimization procedure is developed to determine this schedule. This uses optimal sampling logic derived by applying the Maximum Principle. One non-optimal analysis uses the idea that the addition of a sensor or the increase of the computer processing capability can not degrade the system's performance. The second non-optimal technique obtains approximate values of the system's accuracy by assuming measurement schedules that do not satisfy the processing constraint.

The Procedure is applicable to a large class of air or space missions for which a nominal trajectory can be defined. To illustrate how the Procedure would be used, the design of an aircraft navigation system for operation in the NE corridor is presented. This problem considers the configuration of a system starting with four candidate sensors and three candidate computers. The outputs from all three design options are presented and discussed.

OPTICAL COMMUNICATIONS & DETECTION SYSTEM
DOT–TSC–NASA–71–12
Transportation Systems Center

Buck, R.E., Gagnon, R., Jordan, L.M., Karp, S.
101 p.
August 1971
Laser Pulse Broadening, Earths Atmosphere, 1.06 Micron, Scintillation, Fog, Clear Air.

For primary bibliographic entry, see Field 4.

FLIGHT TEST EVALUATION AND ANALYSIS OF AN OPTICAL IR PWI SYSTEM
DOT–TSC–NASA–72–1
Transportation Systems Center

Phillips, C.O., Concannon, P.A., Brandel, D., Meyer, E.
45 p.
June 30, 1972
Pilot Warning Instrument, Collision Avoidance, Electro Optical PWI System, Optical IR PWI System.

For primary bibliographic entry, see Field 1.

NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION WASHINGTON, D C 20591

OCCUPANT MOTION SENSORS
DOT–TSC–NHSB–71–1
Transportation Systems Center
PB–204–808
Horner, J.L.
54 p.
March 1971
Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, Transducers.

For primary bibliographic entry, see Field 9.

DEVELOPMENT OF ANTICIPATORY AUTOMOBILE CRASH SENSORS
DOT–TSC–NHTSA–71–3
Transportation Systems Center
PB–204–806
Hopkins, Holmstrom, Apgar, Hazel, White, and Newfell

June 30, 1971
Automobile Safety, Occupant Protection, Passive Restraint Activation, Anticipatory Crash Sensing.

For primary bibliographic entry, see Field 13.

OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS
DOT–TSC–NHTSA–71–4
Transportation Systems Center
PB–204–809
Horner, J.L., Ofsevit, D.S., Plant, G.R., Lawrence, G.G.
55 p.

Bandwidth, Rotational Motion, Fourier Analysis, Sensor, Transducer, Acceleration, Angular Motion, Digital Filtering.

For primary bibliographic entry, see Field 9.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D C 20590

A REVIEW OF AVAILABLE L-BAND AND VHF AIRCRAFT ANTENNAS FOR AN AIRCRAFT-SATELLITE COMMUNICATIONS LINK
DOT–TSC–OST–71–8
Transportation Systems Center
Accession No. PB-204799
The Telecommunications Division
93 p.
May 1971
L-Band Antenna, VHF Antenna, Slot-Dipole Antenna, Boeing.

For primary bibliographic entry, see Field 1.

AN AIRPORT AIRSIDE SYSTEM MODEL
DOT–TSC–OST–71–12
Transportation Systems Center
Accession No. PB-204802
Englander, I.

June 1971

For primary bibliographic entry, see Field 1.

ANALYSIS AND COMPARISON OF SOME AUTOMATIC VEHICLE MONITORING SYSTEMS
DOT–TSC–OST–72–32
Transportation Systems Center

Buck, R., Esposito, R., Unkauf, M.
72 p.
July 1973
Automatic Vehicle Monitoring.

For primary bibliographic entry, see Field 13.

ST. LAWRENCE SEAWAY
DEVELOPMENT CORPORATION
WASHINGTON, D C 20590

*** FOURTH COAST-SEAWAY SYSTEMS REQUIREMENTS ANALYSIS VOLUME I - SUMMARY REPORT**
DOT–TSC–SLS–72–1
Transportation Systems Center

Reymond, R.D., Fesler, E.V.
100 p.
March 24, 1972
Traffic Control Systems, Management Information Systems, St. Lawrence Seaway, Commodity Flows, Demand Forecasts, Safety.

This report summarizes the need for an Integrated Marine Traffic Information and Control System (IMTIC) in the St. Lawrence Seaway. The analytic emphasis is on the Welland Canal to Gulf of St. Lawrence portion of the Seaway system. The Upper Great Lakes portion is considered only when interdicting impacts could affect Welland-St.Lawrence subsystem capabilities. An important conclusion is that the total Seaway system and its component elements require immediate and detailed analytical attention if future cargo demands are to be met.

*** FOURTH COAST - SEAWAY SYSTEMS REQUIREMENTS ANALYSIS VOLUME II**
DOT–TSC–SLS–72–2
Transportation Systems Center

Reymond, R.D., Fesler, E.V.
140 p.
March 24, 1972
Traffic Control Systems, Management Information Systems, St. Lawrence Seaway, Commodity Flows, Demand Forecasts, Safety.

This report summarizes the need for an Integrated Marine Traffic Information and Control System (IMTIC) in the St. Lawrence Seaway. The analytic emphasis is on the Welland Canal to Gulf of St. Lawrence portion of the Seaway system. The Upper Great Lakes portion is considered only when interdicting impacts could affect Welland-St.Lawrence subsystem capabilities. An important conclusion is that the total Seaway system and its component elements require immediate and detailed analytical attention if future cargo demands are to be met.

TRANSPORTATION CONTRACTORS

NORTH ATLANTIC SATELLITE ATC CENTER STUDY FINAL REPORT
DOT–TSC–50
International Business Machines Corporation
Accession No. PB-204862

297 p.
April 19, 1971
North Atlantic, Oceanic Control Center, Satellite System, Air Traffic Control.

For primary bibliographic entry, see Field 9.

MARITIME SERVICES SATELLITE SYSTEM DEFINITION STUDY
DOT–TSC–98
Automated Marine International
Accession No. PB-204860
Mendoza, B.A., Lawson, D.C., Heckert, G.P., Luse, J.D.
388 p.
August 1, 1971
Maritime Mobile/Satellite Communications, Multiple Access/Ship Populations/Search And Rescue/Shipboard SATCOM Terminals/Maritime Satellite/Satellite And User Equipment.

For primary bibliographic entry, see Field 1.

FUNCTIONAL ERROR ANALYSIS AND MODELING FOR ATC SYSTEM CONCEPTS EVALUATION
DOT–TSC–212–72–1
Aerospace Systems, Inc.

Hoffman, W.C., Hollister, W.M., Simpson, R.W.
98 p.
May 1972
Air Traffic Control, Error Analysis, Error Models, Simulation, Surveillance Systems.

For primary bibliographic entry, see Field 1.

HIGH LEVEL DATA COMMUNICATION CONTROL PROCEDURES FOR AIR TRAFFIC CONTROL, COMPUTER-TO-COMPUTER DATA INTERCHANGE
DOT–TSC–235
Honeywell, Inc.

Huettner, R.E., Tymann, E.B.
56 p.
September 1971
Air Traffic Control, Control Procedures, Data Communication, Data Interchange.

For primary bibliographic entry, see Field 1.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY–SUMMARY
DOT–TSC–304–1
Autonetics
Accession No. PB-212174
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

For primary bibliographic entry, see Field 1.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY–VOLUME II
DOT–TSC–304–1
Autonetics
Accession No. PB-212175
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

For primary bibliographic entry, see Field 1.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY—VOLUME III
DOT—TSC—304—1
Autonetics
Accession No. PB-212176
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure, Systems Analysis, Operations Analysis.

For primary bibliographic entry, see Field 1.

FOURTH GENERATION AIR TRAFFIC CONTROL STUDY—VOLUME IV
DOT—TSC—304
Autonetics
Accession No. PB-212177
Autonetics

June 1972
Air Traffic Control, Satellite Systems, Airspace Structure Systems Analysis, Operations Analysis.

For primary bibliographic entry, see Field 1.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME II—TECHNOLOGICAL ALTERNATIVES
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212179

April 1972
Air Traffic Control, Air Navigation, Aircraft Surveillance, Communications, Data Link, Satellite Systems, Aircraft Guidance, Automatic Landing, Data Processing, Display Devices.

For primary bibliographic entry, see Field 1.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME III—DEMAND AND TRADE STUDIES
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212180

Air Traffic Control, ATC Performance Trade Studies, Airport Operations Analysis, Runway Acceptance Rates, Queuing Analysis, Airplane Traffic Projections, Computer Modeling.

For primary bibliographic entry, see Field 1.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME IV—SYSTEM SELECTION
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212181

Air Traffic Control, System Synthesis, Evaluation Model, Implementation Plan, Cost Estimation, Weighting Functions.

For primary bibliographic entry, see Field 1.

STUDY AND CONCEPT FORMULATION OF A FOURTH-GENERATION AIR TRAFFIC CONTROL SYSTEM VOLUME V—RECOMMENDED RESEARCH AND DEVELOPMENT
DOT—TSC—306—1
The Boeing Company
Accession No. PB-212182

170 p.
April 1972
Air Traffic Control, ATC, Future ATC System, Fourth-Generation ATC System, Air Transportation, Passenger Demand, Communications, Data Acquisition, Data Processing, Navigation, Gudiance, Airports, Aircraft.

For primary bibliographic entry, see Field 1.

AUTOMOBILE CRASH-SENSOR SIGNAL PROCESSOR
DOT—TSC—409
Burroughs Corporation Defense, Space and Special Systems Group.

100 p.
March 1973
Automobile-Crash, Crash-Sensor, Signal-Processor, Vehicle Passive Restraint System, Passenger Restraint System.

For primary bibliographic entry, see Field 13.

URBAN MASS TRANSPORTATION ADMINISTRATION WASHINGTON, D C 20590

GROUND VEHICLE COMMUNICATIONS & CONTROL
DOT—TSC—UMTA—71—6
Transportation Systems Center

Buck, R.E., Frasco, L.A., Goldfein, H.D., Karp, S., Klein, L., Leonard, E.T., Liu, J., Yoh, P.
164 p.
July 1971
Land Mobile Communications, Electromagnetic Noise, Channel Characterization.

A program for improving vehicular communications in the urban environment is described. The first major item was the development of a capability to measure and record both the multipath structure of any particular urban channel and the associated noise environment. This will be accomplished by outfitting a van to make noise measurements and also to be the receiving site for suitably designed probing signals which will be transmitted from fixed locations. The frequencies to be used are: 149.95, 416.6 and 902.2 MHz.

The second part of the program is directed toward analyzing the noise and multipath characteristics measured above. Effort has been directed toward constructing a channel simulator and a communication system simulator.

Contractor reports are included.

18

18. NUCLEAR SCIENCE AND TECHNOLOGY

NO REPORTS

19

19. ORDNANCE

Includes the following Groups: Ammunition, Explosives, and Pyrotechnics; Bombs; Combat Vehicles, Explosions, Ballistics, and Armor; Fire Control and Bombing Systems; Guns; Rockets; Underwater Ordnance.

OFFICE OF THE SECRETARY
OF TRANSPORTATION
WASHINGTON, D C 20590

*** LABORATORY EVALUATION OF DETECTORS OF EXPLOSIVES' EFFLUENTS**
DOT–TSC–OST–72–27
Transportation Systems Center

Cline, J.E., Hobbs, J.R., Barrington, A.E.
60 p.
November 1972
Explosives Detection, Mass Spectrometer, Gas Chromatograph, Electron Capture Detector, Gas Chromatograph, Bioluminescence, Dynamite, TNT.

For primary bibliographic entry, see Field 14.

20

20. PHYSICS

Includes the following Groups: Acoustics; Crystallography; Electricity and Magnetism; Fluid Mechanics; Masers and Lasers; Optics; Particle Accelerators; Particle Physics; Plasma Physics; Quantum Theory, Solid Mechanics; Solid-state Physics, Thermodynamics; Wave Propagation.

UNITED STATES COAST GUARD
WASHINGTON, D C 20591

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION
DOT–TSC–CG–71–3
Transportation Systems Center
Accession No. PB-204805
Lifsitz, J.R., Ingrao, H.C.

June 1971
Fog Bank Detection, LIDAR, Aid-to-Navigation, Radiometer.

For primary bibliographic entry, see Field 8.

FEDERAL HIGHWAY ADMINISTRATION
WASHINGTON, D C 20590

MANUAL FOR HIGHWAY NOISE PREDICTION
DOT–TSC–FHWA–72–1
Transportation Systems Center

Wesler, J.E.
75 p.
March 1972
Traffic Noise Prediction, Highway Noise Simulation, Traffic Noise Levels.

This manual is intended for use as a tool in predicting the noise which will be generated by freely-flowing vehicle traffic along a highway of known characteristics. The manual presents two separate approaches to the prediction problem. The first approach utilizes a simple nomograph to provide first-approximation solutions to the traffic noise prediction problem. The second approach utilizes a computerized traffic noise simulation model, for more accurate and more flexible noise level predictions. This volume contains an explanation of the bases for both approaches, to indicate the assumptions and limitations inherent in the prediction procedures, and a User's Manual for the computer program. Appendix B, published under separate cover, contains the Programmer's Manual and the computer listing for the simulation model. A short version of this report without Appendices A and B, is published as Report DOT-TSC-FHWA-72-2 for convenient use by most users.

MANUAL FOR HIGHWAY NOISE PREDICTION APPENDIX B
DOT–TSC–FHWA–72–1
Transportation Systems Center

Wesler, J.E.
80 p.
March 1972
Traffic Noise Prediction, Highway Noise Simulation, Traffic Noise Levels.

The basic manual, published as the first volume of this report, is intended for use as a tool in predicting noise levels which will be generated by freely-flowing vehicle traffic along a highway of known characteristics. The first volume explains the basis for the computerized prediction model, used for highway noise level prediction, and contains the user's manual for the computer program. This volume contains the programmer's manual for the computer program, and the program listing in FORTRAN IV.

MANUAL FOR HIGHWAY NOISE PREDICTION (SHORT VERSION)
DOT–TSC–FHWA–72–2
Transportation Systems Center

Wesler, J.E.
47 p.
March 1972
Traffic Noise Prediction, Highway Noise Simulation, Traffic Noise Levels.

This manual is intended for use as a tool in predicting the noise which will be generated by freely-flowing vehicle traffic along a highway of known characteristics. The manual presents two separate approaches to the prediction problem. The first approach utilizes a simple nomograph to provide first-approximation solutions to the highway noise prediction problem. The second approach utilizes a computerized traffic noise simulation model, for more accurate and more flexible noise level predictions. This report is a short version of Report No. DOT-TSC-FHWA-72-1, consisting of only the first four sections of that longer report for more convenient use by most of those involved in highway noise predictions. This report contains a brief description of the bases for both prediction approaches, to indicate the assumptions and limitations inherent in the procedures, and a Users' Manual for the computer program. Appendicies A and B of the longer report provide a more detailed description of the prediction theory, and a Programmers' Manual.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

MEASUREMENTS AND ANALYSIS OF 115 KV POWER LINE NOISE AND ITS EFFECT ON PUEBLO TEST SITE RADIO LINKS
DOT–TSC–FRA–72–5
Transportation Systems Center
Accession No. PB-202623
Buck, R.E., Esposito, R.E., Gagnon, R., Leonard, E.T., Kodis, R.D., Yoh, P.
45 p.
May 1972
Power Line Noise, Radio Noise, Impulse, Communications.

Noise measurements were made for 115 kV power lines near the frequencies 166, 217 and 406.8 MHz with a receiver bandwidth of 1 MHz. The measurements consisted of counting the numbers of pulses per minute at preset threshold values and RMS. The variations of the noise level vs the lateral distance from the power line were also measured. The worst

noise level, -40 dBm, was observed at 217 MHz under a noisy power line. The results of these measurements show that, under normal conditions, power line noise will not have significant effects on the radio links at the Pueblo Test Site. Recommendation is made for a monitoring system to detect the level of a noisy power line when its noise reaches a preset level. Further studies are recommended of other possible noise sources -- automobile ignition noise, electrical equipment noise -- and of the multipath effects.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION WASHINGTON, D C 20590

ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 KHZ (100 KM) - 3,000 THZ (0.1 μM)
DOT–TSC–NASA–71–6
Transportation Systems Center
Accession No. N71-20121
Thompson, W.I. III
300 p.
February 1971
Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, Ultraviolet.

For primary bibliographic entry, see Field 4.

MILLIMETER-WAVE GENERATION WITH SPIRALING ELECTRON BEAMS
DOT–TSC–NASA–71–7
Transportation Systems Center

Kulke, B.
98 p.
February 1971
Spiraling Electron Beam, Microwave Cavity, 9.4 and 94 GHz, High-Power Millimeter Waves.

For primary bibliographic entry, see Field 11.

EVALUATION OF NONDESTRUCTIVE TENSILE TESTING
DOT–TSC–NASA–71–10
DOT/Transportation Systems Center
Accession No. N71-3756
Bowe, J.J., Polcari, S.M.

May 1971
Semiconductor Devices, Nondestructive Testing, Chip and Wire Bonding.

For primary bibliographic entry, see Field 9.

NATIONAL HIGHWAY TRAFFIC AND SAFETY ADMINISTRATION WASHINGTON, D C 20590

OCCUPANT MOTION SENSORS
DOT–TSC–NHSB–71–1
Transportation Systems Center
PB–204–808
Horner, J.L.
54 p.
March 1971
Fourier Spectrum, Bandwidth, Acceleration, Rotational Motion, Sensors, Transducers.

For primary bibliographic entry, see Field 9.

OCCUPANT MOTION SENSORS: METHODS OF DETECTION AND ANALYSIS
DOT–TSC–NHTSA–71–4
Transportation Systems Center
PB–204–809
Horner, J.L., Ofsevit, D.S., Plant, G.R., Lawrence, G.G.
55 p.

Bandwidth, Rotational Motion, Fourier Analysis, Sensor, Transducer, Acceleration, Angular Motion, Digital Filtering.

For primary bibliographic entry, see Field 9.

OFFICE OF THE SECRETARY OF TRANSPORTATION WASHINGTON, D C 20590

THE NOISE EXPOSURE MODEL MOD 4
DOT–TSC–OST–71–14
Transportation Systems Center
Accession No. PB-211977
Hinckley, R.H., Wesler, J.E.
90 p.
August 1971
Noise Exposure, Noise Exposure Forecast (NEF), Airport Noise.

For primary bibliographic entry, see Field 9.

APPENDIX C: THE NOISE EXPOSURE MODEL MOD 4
DOT–TSC–OST–71–16
Transportation Systems Center
Accession No. PB-211978

57 p.
August 1971

For primary bibliographic entry, see Field 9.

A COMMUNITY NOISE SURVEY OF MEDFORD, MASSACHUSETTS
DOT–TSC–OST–72–1
Transportation Systems Center
Accession No. PB-211975
Noise Abatement Group
594 p.
August 1971
Noise Abatement, Transportation Noise, Community Noise Levels.

For primary bibliographic entry, see Field 6.

MEASUREMENT OF AMBIENT NOISE LEVELS IN THE FLORIDA EVERGLADES
DOT–TSC–OST–72–2
Department of Transportation
Accession No. PB-212197
Quinn, R.W.
54 p.
September 1971
Noise Levels, Aircraft Noise, Noise Measurement.

For primary bibliographic entry, see Field 6.

THE NOISE EXPOSURE MODEL MOD 5 VOLUME 1
DOT–TSC–OST–72–5
Transportation Systems Center
Accession No. PB-211979
Taub, J., Foreman, T., Brownfield, B.
94 p.
November 1971
Noise Abatement, Airport Aircraft Noise.

For primary bibliographic entry, see Field 6.

AMBIENT NOISE LEVEL MEASUREMENTS IN PROPOSED FLORIDA AIRPORT AREA
DOT–TSC–OST–72–19
Transportation Systems Center
Accession No. PB-214459
Quinn, R.W.
120 p.
December 1972
A-Weighted Sound Level, Walsh-Healey Exposure, Median Noise Level, L-10 Noise Level, Noise-Pollution Level.

For primary bibliographic entry, see Field 8.

MBTA RAPID TRANSIT SYSTEM (RED LINE) WAYSIDE AND IN-CAR NOISE AND VIBRATION LEVEL MEASUREMENTS
DOT–TSC–OST–72–31
Transportation Systems Center

Rickley, E.J., Quinn, R.W.
246 p.
August 1972
Noise, Abatement, Noise Transportation, Noise And Vibration Transit Cars, Rapid.

Wayside and in-car noise and vibration characteristics of a late-model mass transit car making up 2-car and 4-car trains are tabulated and analyzed in this report. The MBTA Type 1 South Shore Rapid Transit Car, designed and built by Pullman Standard, Chicago, Illinois and currently in operation on the Red Line of the Massachusetts Bay Transportation Authority (MBTA) was measured.

Wayside measurements had been made by the tracks of the South Shore Extension of the Red Line 58 days after the official September 1, 1971 opening of this extension. These wayside measurements were repeated six months later.

In-car noise and vibration measurements are made in a selected 2-car train on a typical run over various sections of the Red Line.

INVESTIGATION OF JET NOISE USING OPTICAL HOLOGRAPHY
DOT–TSC–OST–73–11
Massachusetts Institute of Technology
Accession No. PB-214112
Salant, R.F.
60 p.
April 1973
Optical Holography, Supersonic Jet Noise, Mach Waves.

For primary bibliographic entry, see Field 1.

PREDICTION OF V/STOL NOISE FOR APPLICATION TO COMMUNITY NOISE EXPOSURE
DOT–TSC–OST–73–19
United Aircraft Corp.
Accession No. PB-221146
Munch, C.L.
280 p.
May 1973
Noise Abatement Aviation Sources, V/STOL Noise, Community Noise Exposure.

For primary bibliographic entry, see Field 1.

COMPARATIVE STUDIES OF THE SUPERSONIC JET NOISE GENERATED BY RECTANGULAR AND AXISYMMETRIC NOZZLES
DOT–TSC–OST–73–22
Massachusetts Institute of Technology

Low, K.C., Louis, J.F.
118 p.
June 1973
Supersonic Jet Noise, Axisymmetric Nozzle, Rectangular Nozzle, Mach Wave, Turbulence Shock Interaction, Scaling Laws of Supersonic Jet Noise.

For primary bibliographic entry, see Field 1.

TRANSPORTATION CONTRACTORS

MODELING OF V/STOL NOISE IN CITY STREETS
DOT–TSC–93–1
Massachusetts Institute of Technology
Accession No. PB-211953
Lyon, R.H., Pande, L., Kinney, W.A.
49 p.
November 15, 1971
Noise Levels, V/STOL Noise, Noise Propagation, Urban Noise Propagation.

For primary bibliographic entry, see Field 1.

A SYSTEMATIC STUDY OF SUPERSONIC JET NOISE
DOT–TSC–142–1
Massachusetts Institute of Technology
Accession No. PB-211954
Louis, J.F.
64 p.
December 1971
Supersonic Jet Noise, Axisymmetric Nozzle, Turbulent Mixing, Rectangular Nozzle, Shock Unsteadiness, Mach Wave, Turbulence Shock Interaction.

For primary bibliographic entry, see Field 1.

A SCALE MODEL AIRCRAFT & ANTENNA PATTERN TEST PROGRAM
DOT–TSC–167–(6)
Diamond Antenna & Microwave Corp.

McCabe, W.J.
111 p.
November 15, 1971
Aircraft Antennas, Model Aircraft, Polarization, Antenna Coverage, Aerosat Sys, Aircraft Antenna Location.

For primary bibliographic entry, see Field 1.

ANALYSIS OF POTENTIAL NOISE SOURCES OF TRACKED AIR CUSHION VEHICLES (TACV)
DOT–TSC–194–1
Bolt Beranek and Newman Inc.

Bender, E.K., Hayden, R.E., Heller, H.H.
104 p.
July 1971
Noise Levels, Tracked Air Cushion Vehicles, Compressor Noise, Aerodynamic Noise, Linear Induction Motor Noise, Current-Collection Noise.

This report presents an evaluation of the principal sources of noise from tracked air cushion vehicles (TACVs). The study is based on analyses of and laboratory experiments on existing TACVs and rapid transit systems.

Measurements of two French TACV systems were conducted, one a 44-passenger prototype suburban vehicle propelled by a linear induction motor (LIM), and the second an 80-passenger intercity vehicle powered by a gas turbine and shrouded pusher propeller.

Noise levels from a slider current-collection system were also obtained through measurements of the noise and vibration of a third-rail contact shoe on a rail rapid transit car.

URBAN MASS TRANSPORTATION ADMINISTRATION
WASHINGTON, D C 20590

BIBLIOGRAPHY ON GROUND VEHICLE COMMUNICATION & CONTROL: A KWIC INDEX
DOT–TSC–UMTA–71–3
Transportation Systems Center
Accession No. PB-204807
Thompson, W.I. III
191 p.
August 1971
Bibliography.

For primary bibliographic entry, see Field 9.

NOISE LEVEL MEASUREMENTS ON THE UMTA MARK I DIAGNOSTIC CAR (R42 MODEL)
DOT–TSC–UMTA–72–3
Transportation Systems Center (TSC)

Rickley, E.J., Quinn, R., Byron, G.
100 p.
October 1971
Noise Abatement, Transportation Noise, Mass Transit Cars.

For primary bibliographic entry, see Field 14.

21. PROPULSION AND FUELS

Includes the following Groups; Air-breathing Engines; Combustion and Ignition; Electric Propulsion; Fuels; Jet and Gas Turbine Engines; Nuclear Propulsion; Reciprocating Engines; Rocket Motors and Engines; Rocket Propellants.

FEDERAL RAILROAD ADMINISTRATION
WASHINGTON, D C 20590

POWER CONDITIONING FOR HIGH-SPEED TRACKED VEHICLES
DOT–TSC–FRA–71–1A
Transportation Systems Center
Accession No. PB-210743
Raposa, F.L.
65 p.
February 1971
Linear Induction Motor, Speed Control, Power Conditioner, On-Board Electric Power Sources, Wayside Electric Power.

For primary bibliographic entry, see Field 9.

METROLINER AUXILIARY POWER ELECTRICAL SYSTEM RELIABILITY STUDY
DOT–TSC–FRA–71–2
U.S. Department of Transportation
Accession No. PB-204795
Abbas, J.D., Watt, C.W. Jr.
135 p.
June 1971

For primary bibliographic entry, see Field 9.

POWER CONDITIONING FOR HIGH SPEED TRACKED VEHICLES
DOT–TSC–FRA–72–13
Transportation Systems Center

Raposa, F.L., Knutrud, T., Wawzonek, J.J.
252 p.
January 1973
Variable Frequency Power, Power Conditioning.

For primary bibliographic entry, see Field 13.

OFFICE OF THE SECRETARY OF TRANSPORTATION
WASHINGTON, D C 20590

AIRCRAFT EMISSIONS SURVEY
DOT–TSC–OST–71–5
DOT/Transportation Systems Center
Accession No. PB-204794
Broderick, A.J., Harriott, W.F., Walter, R.A.

March 31, 1971
Air Pollution, Gas Turbines, Emissions, Jet Engines, Instrumentation.

For primary bibliographic entry, see Field 1.

RESEARCH AND DEVELOPMENT OPPORTUNITIES FOR IMPROVED TRANSPORTATION ENERGY USAGE
DOT–TSC–OST–73–14
Transportation Systems Center
Accession No. PB-220612
Transportation Energy Panel
94 p.
September 1972
Transportation, Energy, Transportation Energy, Energy Utilization, Fuel Economy, Heat Engines.

For primary bibliographic entry, see Field 10.

URBAN MASS TRANSPORTATION ADMINISTRATION
WASHINGTON, D C 20590

A SURVEY OF VARIABLE VOLTAGE POWER CONDITIONERS FOR APPLICATION TO THE TRACKED AIR CUSHION VEHICLE
DOT–TSC–UMTA–71–4
Transportation Systems Center

Cacossa, R.A.
22 p.
March 1971
Solid State Switches, Induction Motors, Power Conditioning.

For primary bibliographic entry, see Field 9.

* **SURVEY OF SLIDING CONTACT/SOLID RAIL COLLECTION SYSTEMS FOR APPLICATION TO THE TRACKED AIR CUSHION VEHICLE**
DOT–TSC–UMTA–71–5
Transportation Systems Center

Spenny, C.H.
42 p.
March 1971
Power Collection, Sliding Contact Power Collection, High Speed Track Vehicles.

For primary bibliographic entry, see Field 9.

DEVELOPMENT AND TESTING OF A COMPLETELY PASSIVE, AIR SUSPENDED, AIR PROPELLED PERSONAL RAPID TRANSIT VEHICLE
DOT–TSC–UMTA–73–1
Transportation Systems Center

Smoot, C.H., et al
102 p.
April 1973
PRT (Personal Rapid Transit), Air Cushion Vehicles, Passive Vehicle, Circulation and Distribution.

For primary bibliographic entry, see Field 13.

22. SPACE TECHNOLOGY

Includes the following Groups: Astronautics; Spacecraft; Spacecraft Trajectories and Reentry; Spacecraft Launch Vehicles and Ground Support.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D C 20590

EARTH SURVEY BIBLIOGRAPHY: A KWIC INDEX OF REMOTE SENSING INFORMATION
DOT–TSC–NASA–70–1
Transportation Systems Center
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Thompson, W.I. III
265 p.
February 1971
Earth Resources, Infrared Radar, Visible, Microwaves.

For primary bibliographic entry, see Field 8.

LABORATORY EVALUATION OF FECKER AND LORAL OPTICAL IR PWI SYSTEMS
DOT–TSC–NASA–71–5
Transportation Systems Center
Accession No. N71-13351
Gorstein, M., Hallock, J.N., Houten, M., McWilliams, I.G.
81 p.
February 1971
Electro-Optical PWI, Flashing Xenon Strobe, Fault Correction, Calibrate In Azimuth Elevation And Range.

For primary bibliographic entry, see Field 1.

ATMOSPHERIC TRANSMISSION HANDBOOK: A SURVEY OF ELECTROMAGNETIC WAVE TRANSMISSION IN THE EARTH'S ATMOSPHERE OVER THE FREQUENCY (WAVELENGTH) RANGE 3 KHZ (100 KM) - 3,000 THZ (0.1 μM)
DOT–TSC–NASA–71–6
Transportation Systems Center
Accession No. N71-20121
Thompson, W.I. III
300 p.
February 1971
Earth-to-Space Paths, Transmission Fundamentals, Transmission Properties, Transmission Information, Propagation, Infrared, Visible, Radio, Microwave, Ultraviolet.

For primary bibliographic entry, see Field 4.

MILLIMETER-WAVE GENERATION WITH SPIRALING ELECTRON BEAMS
DOT–TSC–NASA–71–7
Transportation Systems Center

Kulke, B.
98 p.
February 1971
Spiraling Electron Beam, Microwave Cavity, 9.4 and 94 GHz, High-Power Millimeter Waves.

For primary bibliographic entry, see Field 11.

METALLIZATION FAILURES
DOT–TSC–NASA–71–9
Transportation Systems Center
Accession No. N72-13390
Beatty, R.
116 p.
May 1971
Metallization Failures, Integrated Circuit Failures, Metallization Material, Multilevel Metallization, Integrated Circuit Design, Beam Lead Technology.

For primary bibliographic entry, see Field 7.

EVALUATION OF NONDESTRUCTIVE TENSILE TESTING
DOT–TSC–NASA–71–10
DOT/Transportation Systems Center
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Bowe, J.J., Polcari, S.M.

May 1971
Semiconductor Devices, Nondestructive Testing, Chip and Wire Bonding.

For primary bibliographic entry, see Field 9.

MEASUREMENTS OF TRANSATMOSPHERIC ATTENUATION STATISTICS AT THE MICROWAVE FREQUENCIES: 15, 19 AND 34 GHZ.
DOT–TSC–NASA–71–13
Transportation Systems Center

Haroules, G.G., Brown, W.E. III, Bishop, G.J.
42 p.
June 1971
Earth-to-Space Paths, Electromagnetic Wave Propagation, Atmospheric Attenuation.

For primary bibliographic entry, see Field 3.

OFFICE OF THE SECRETARY OF TRANSPORTATION
WASHINGTON, D C 20590

A REVIEW OF AVAILABLE L-BAND AND VHF AIRCRAFT ANTENNAS FOR AN AIRCRAFT-SATELLITE COMMUNICATIONS LINK
DOT–TSC–OST–71–8
Transportation Systems Center
Accession No. PB-204799
The Telecommunications Division
93 p.
May 1971
L-Band Antenna, VHF Antenna, Slot-Dipole Antenna, Boeing.

For primary bibliographic entry, see Field 1.

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Barrington, A.E.

May 1971

TWO CANDIDATE SYSTEMS FOR UNMANNED FOG BANK DETECTION
DOT–TSC–CG–71–3
Transportation Systems Center
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Lifsitz, J.R., Ingrao, H.C.

June 1971

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DOT/Transportation Systems Center
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Transportation Systems Center

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DOT–TSC–USCG–72–2
Transportation Systems Center

Lifsitz, J.R., Yaffee, M.Y.
36 p.
December 1971

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Walter, R.A., Broderick, A.J., Sturm, J.C., Klaubert, E.C.
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WASHINGTON, D C 20590

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LINEARIZED MATHEMATICAL MODELS FOR DE HAVILLAND CANADA "BUFFALO & TWIN OTTER" STOL TRANSPORTS
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MacDonald, R.S., Garelick, M., O'Grady, J.

PRELIMINARY SURVEY OF POTENTIAL STOL TERMINAL AREA OPERATIONAL REQUIREMENTS
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Farr, E.H., Frasco, L.A., Goldfein, H.D., Snow, R.M.
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Wagner, G.W., Haroules, G.G., Brown, W.E.
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VISIBILITY CONCEPTS AND MEASUREMENT TECHNIQUES FOR AVIATION PURPOSES
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