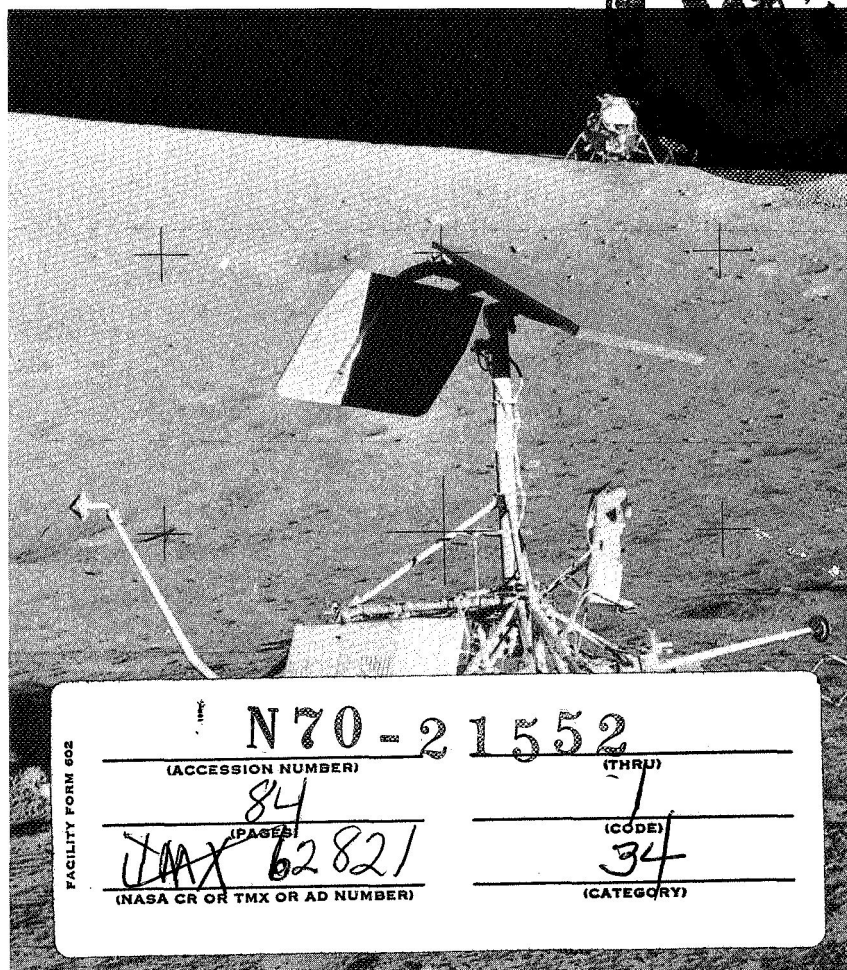


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THE NASA SCIENTIFIC AND TECHNICAL INFORMATION SYSTEM

...Its Scope and Coverage



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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

FOREWORD

The NASA scientific and technical information system has been developed to maximize the use of newly acquired knowledge for all men's benefit. It is highly specialized and highly automated primarily to meet the needs of the many participants in the exploration of space, but other government, industrial, and academic groups have found the system helpful in a great variety of other endeavors.

Thousands of documents are added to this information bank every month. Many others are rejected to prevent the scope and coverage of this system from overlapping and excessively duplicating the services of other large information storage and dissemination programs. This publication lists the criteria that currently govern decisions regarding additions to the NASA collections.

The rapid advances in science, engineering, and technology applicable to innumerable aerospace tasks—and the increasing erosion of the mechanical, disciplinary, and geographical barriers to the transfer of technical information and data—make it imperative that the coverage of this system be reviewed frequently. So, as much as this publication is a current “table of contents,” it is also a guide to those who can usefully suggest adjustments in the scope of the NASA scientific and technical information system to meet its constantly changing needs.

JOHN F. STEARNS, DIRECTOR
Scientific and Technical Information Division
Office of Technology Utilization
National Aeronautics and Space Administration

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INTRODUCTION

This publication is a working guide for individuals who scan the published and report literature for documents to be added to the National Aeronautics and Space Administration's scientific and technical information system. It is also intended to inform users of the abstract journals, bibliographic searches, and current awareness services produced by this system of its contents and potential output.

Broadly stated, NASA's objectives in acquiring documents that meet the subject criteria expressed in this publication are twofold: (1) To select information that will give participants in NASA programs the scientific and technical results of aeronautical and aerospace research that may be helpful in their research, development, testing, and evaluation efforts and (2) to make the widest practicable and appropriate announcement of this information to the world's scientific community by citations in abstract journals and other announcement media.¹

The multidisciplinary interests of NASA require both broad coverage and careful selection of reports, journal articles, books, and conference papers for the agency's information bank.

In science, NASA is interested in the properties of the Earth, Moon, and planets; in Earth-Sun relations; in the space environment; in the physical nature of the universe; and in the possibilities of extraterrestrial life.

In technology, NASA is concerned with providing knowledge pertinent to spacecraft and launch vehicles; aircraft, including V/STOL and supersonic aircraft; propulsion; space power; human factors; and electronics.

In space applications, NASA is interested in meteorological, astronomical, geophysical, and communications systems, and in helping non-aerospace industries obtain information regarding beneficial technological developments resulting from the space program.

Specific programs are aimed at determining how man performs in the space environment, as in maneuvering spacecraft and performing extravehicular activity. Other programs attempt to define mission profiles and determine the feasibility of trips to the Moon, planets, comets, and asteroids. These studies require analyses of mission requirements, trajectories, spacecraft technology,

¹The principal abstract journals, *Scientific and Technical Aerospace Reports* and *International Aerospace Abstracts*, and other publications and information services are described in the booklet, *The NASA Scientific and Technical Information System ...And How to Use It*, available free of charge from the NASA Scientific and Technical Information Facility, P.O. Box 33, College Park, Maryland 20740.

and conceptual designs. Supporting programs involve study of chemical and nuclear propulsion, solar and radioisotope auxiliary power, spacecraft electronics and control, life-support systems, instrumentation, and tracking.

Some sciences and technologies are both agents and objectives for NASA programs. Thus astronomy and astrophysics are necessary for the navigation of spacecraft on predetermined courses; the observations made from manned and unmanned spacecraft in turn add to men's astronomical and astrophysical knowledge. The chemistry of engineering materials must be known to construct vehicles suitable for space, and the reaction of the construction materials when exposed to the space environment increases knowledge of engineering chemistry.

NASA needs to know more about a vast and growing number of scientific and technical subjects to continue its space ventures. There is also a rapidly growing aggregation of documents recording new knowledge in nearly all subject fields. But no single collection can be universal; no one can anticipate completely the needs of the next research project to be undertaken. Therefore, the NASA collection is not all-inclusive; it is developed with the awareness that other collections of documented knowledge are available and that background and peripheral material will be borrowed as needed from such collections. Only those reports and publications having strong relevance to aerospace science and technology are retained in the NASA scientific and technical information collection.

NASA's scientific and technical information interests are summarized here under the same subject categories that are used in the abstract journals *Scientific and Technical Aerospace Reports* and *International Aerospace Abstracts*. The interest in each category may be "exhaustive," "selective," or "negative."

Exhaustive interest in a subject indicates that it lies almost wholly within aerospace science and technology. Nearly all documents on such a subject will be of interest and should be maintained in the NASA collection. Selective interest implies that a subject is broader than NASA's direct interest in aerospace science and technology, but that a number of reports or published literature items may bear on one or more NASA programs. The responsible individual scanning the literature will select these documents carefully.

The selection of information and data for retention in the NASA system requires familiarity with the agency's programs, the shifting emphasis among them, and the possibilities of new research and development areas. Useful sources of information concerning NASA programs are the annual NASA Authorizations Hearings before congressional committees. Fortunately, for the limited purposes of literature scanning and selection, specific awareness of each NASA contract and itemized project is not necessary. The literature needed for these specific work efforts would normally fall within the relatively broad scope of the topics referred to in this publication.

AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 *Aircraft* and 31 *Space Vehicles*. For related information see also: 12 *Fluid Mechanics*; and 33 *Thermodynamics and Combustion*.

General definition: That branch of physics which treats of relative motion between air and bodies. These bodies may be ground structures, houses, hangars, or bridges acted upon by wind; or moving objects such as aircraft, ships, automobiles, missiles, and rockets passing through the air at various speeds. *Encyclopedia Americana*, 1960 Edition, Vol. 1, p. 179.

NASA Interest

Exhaustive interest: All information dealing with the effects of relative motion on the flow of air or other gases and vapors, at any velocity, over aircraft, spacecraft, launch vehicles, missiles, and their components; over geometric shapes of models used in laboratory and wind tunnel tests; e.g., cones, plates, shells; internal flow in channels, ducts, and turbomachines; forces acting on bodies in aerodynamic flow, including aerodynamic lift and drag. (Aerodynamic heating is of exhaustive interest, but documents should be assigned to Category 33.)

Negative interest: Aerodynamics of surface structure, ships, bridges, etc., other than ground support equipment for aerospace research.

Input Subjects of Specific Interest

- Aerodynamic flow fields
- Aerodynamics of:
 - Airfoils
 - Control and stabilization surfaces
 - Launch vehicles configurations and models
 - Lifting bodies
 - Spacecraft configurations and models
 - Struts, braces, fairings, landing gear, antennas, and other protuberances
 - Wings, rotors, and propellers

- Aerodynamic problems related to aircraft propulsion system dynamics, particularly the interaction of inlet-engine-nozzle and aircraft-engine control systems
- Aerodynamic problems peculiar to the low-speed operation of aeronautical vehicles including low-speed operation of high-speed aircraft, VTOL and STOL aircraft, and rotary wing aircraft (helicopters)
- Aerodynamic studies of skin friction
- Air flow separation
- Boundary layer flow (Boundary layer thermal effects and combustion are entered under Category 33, *Thermodynamics and Combustion*.)
- Buffeting
- Internal flow in ducts and turbomachinery
- Supercritical airfoils
- Supercritical wings
- Wind tunnel tests (Full-scale tests or models of specific vehicles aircraft are entered under Category 02, *Aircraft*.)

CATEGORY 02

AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc. and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 *Aerodynamics*. For related information see also; 32 *Structural Mechanics*.

General definition: Any structure, machine, or contrivance, especially a *vehicle*, designed to be supported by . . . dynamic action of the air upon the surface of the structure or object, or by its own buoyancy. . . *Dictionary of Technical Terms for Aerospace Use*. Wm. H. Allen, ed., 1965. NASA SP-7.

NASA Interest

Exhaustive interest: Research, development, testing, evaluation, or performance of any complete aircraft, aircraft engine, system, or component; operating procedures and problems that affect or are affected by design, development, testing, evaluation, or performance; economics of aircraft operation, particularly as affected by development of new types of aircraft.

Negative interest: Routine operation of commercial aircraft; regular flight schedules; airline rates; commercial flight reports.

Aircraft Types of Specific Interest

- Low-speed, subsonic, transonic, supersonic, hypersonic
- Helicopters and other rotating wing
- Fixed wing, variable wing, autogyros, convertiplanes, ornithopters
- Short takeoff and landing (STOL); vertical takeoff and landing (VTOL)
- Balloons and inflatable devices, airships, dirigibles, blimps (Self-erecting items for space are covered in Category 03, *Auxiliary Systems*.)
- Gliders, kites, parachutes, decelerators
- Ground effect machines, hovercraft, air cushion vehicles

Input Subjects of Specific Interest

- Aircraft structures, including strength, stiffness, vibration modes and frequencies, flutter, thermal resistance, structural efficiency
- Acoustic problems, noise abatement, sonic boom
- Operational effects of atmospheric variables, weather, buffeting, air temperature, lightning, clear air turbulence
- Accidents and emergencies, including collisions with birds, foreign objects, and other aircraft
- Flight safety, ditching, thrust reversal, pilot procedures
- Crew and vehicle protection techniques, survival, escape, restraint harness, fire, explosions
- Performance, reliability, durability, safety, and economics of airbreathing propulsion systems
- Research and development on complete engines and engine components, including inlets, fans, compressors, combustors, turbines, augmentors, exhaust nozzles, thrust defectors, propellers, thrust reversers
- Structure environment and design conditions of aircraft, mission and operations evaluation, critical ground and flight loads distribution, thermal loads (Research and development not specific to particular aircraft are covered in Category 32, *Structural Mechanics*.)
- Aircraft propulsion system dynamics, e.g., the interaction of inlet-engine nozzle system with the engine control system
- Flight dynamics, handling qualities, flight test techniques, attitude control, flight path control, stability augmentation, display systems (Display and instrumentation, unless specific to a particular aircraft, are covered in Category 14, *Instrumentation and Photography*.)
- Wind tunnel test of full-scale or model aircraft

CATEGORY 03

AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines; hydraulic, pneumatic, and electrical systems; and inverters. For related information see also: 09 *Electronic Equipment*; 22 *Nuclear Engineering*; and 28 *Propulsion Systems*.

General definition: A system . . . that serves as an aid or adjunct in the performance of functions by other systems. *The Second Aerospace Glossary*. W. A. Heflin, ed. Aerospace Studies Institute, Air University, 1966.

NASA Interest

Exhaustive interest: Information dealing with any systems or developments that may provide on-board power, control, and miscellaneous functions for aircraft, satellites, or manned spacecraft. (Systems specific to life support are covered in Category 05, *Biotechnology*; to propulsion of any type in Category 28, *Propulsion Systems*; and to structural rigidity and shape in Category 32, *Structural Mechanics*. Any systems involving nuclear or radioisotopic power are covered in Category 22, *Nuclear Engineering*.)

Selective interest: Ground-based power and auxiliary equipment that might be of interest in the development of aerospace auxiliary systems. (Systems specific to ground operations of aircraft or launch vehicles are covered in Category 11, *Facilities, Research, and Support*.)

Input Subjects of Specific Interest

- Chemical batteries characterized by light weight, long life, high power/weight ratio, and/or resistance to extremely high or low temperatures or radiation; e.g., mercury batteries, nickel-cadmium batteries, silver batteries, and others determined from document context
- Fuel cells (comprehensive coverage)
- Solar power sources, including solar cells, solar turbines, and related information on photovoltaic and thermionic energy converters, thermocouples, and metal vapor turbines

- Electrical energy storage and conditioning systems for on-board use
- On-board electric generators and motors, relays, switches, and other electrical equipment
- Mechanical systems for on-board use, including actuators, hydraulic systems and components, pneumatic systems and components
- Air conditioning, heating and ventilating systems, and cooling systems including space radiators
- Safety systems, including alarms, escape systems, and ejection seats (If closely related to a specific aircraft or spacecraft, these subjects will be covered in Categories: 02 *Aircraft*, 14 *Instrumentation and Photography*, or 31 *Space Vehicles*.)

BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems: physiological and psychological factors. For related information see also: 05 *Biotechnology*.

General definition: (In NASA usage, the term approaches synonymy with Exobiology.) Exobiology is the scientific treatment of life under extraterrestrial conditions . . . the study of the effects of the space environment on life; the origin of life; and the search for life within the universe. *Principles of Bioastronautics*. S. J. Gerathewohl. Prentice-Hall, Inc., Englewood Cliffs, N. J., 1963, p. 23.

NASA Interest

Exhaustive interest: The search for and study of the origin of extraterrestrial life; planetary quarantine and spacecraft sterilization; effects of the space environment and simulated planetary environments on growth and behavior of living organisms; aerospace medicine; origin of living organisms and adaptation to the space environment.

Selective interest: Fundamental research concerning the nature of life and living organisms; the effect of other than space or planetary environment on living organisms; radiation effects other than those engendered by space radiation; basic attributes of life, such as chemical composition, growth, development, and reproduction; adaptation of life to extreme conditions of altitude, temperature, drought, etc.

Input Subjects of Specific Interest

- Origin of life, including research on abiogenesis, chemical and protobiological evolution
- Biochemical research related to detection of life, e.g., analysis of nucleosides, amino acid and protein analysis, and synthesis; enzyme structure and activity
- Organic geochemistry and the effects of micro-organisms on geological processes

- Sampling techniques possibly applicable to planetary soils and atmospheres, combined with culturing and life detection
- Sterilization of spacecraft and components; clean rooms as related to avoidance of lunar and planetary contamination
- Quarantine procedures applicable to returning astronauts and samples of lunar and planetary materials
- Effects of unusual and extreme environments on living organisms including unusual chemical composition of atmospheres, atmospheric pressures, absence of magnetic fields, intense magnetic fields, extremely high or low temperatures, variations in light intensities; unusual characteristics of illumination, as infrared or ultraviolet; effects of continuous irradiation, as by cosmic rays
- Effect of reduced or zero gravity and of increased gravity as in centrifuges
- Effects of rotation and acceleration
- Fundamentals of hibernations and estivation
- Ecology of closed systems
- Principles of homeostasis, especially under prolonged or unusual changes in environment
- Circadian rhythms
- Aerospace medicine, including pharmacological studies on animals exposed to the space environment; diagnosis and treatment of non-space related ills in astronauts

CATEGORY 05

BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 *Biosciences*.

General definition: Biotechnology is based on the concept that the characteristics of the human operator must be matched with the requirements of work plans and machine design so that the capabilities of the first can be utilized to obtain maximum efficiency in the latter. Bioengineering requires the analysis of human behavior, skill, and tolerances, and the application of this information for the development of an integrated man-machine system. *Principles of Bioastronautics*. S. J. Gerathewohl. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1963.

NASA Interest

Exhaustive interest: Effects of the space environment on man and, where directly applicable to humans, of primates; life support systems; instrumentation to measure physiological and psychological behavior of humans and lower primates under remote or engineered environments; space flight and launch crew safety; selection and training of astronauts; aerospace medicine applicable to space-related ills. (The emphasis in this category is on humans; related physiological and behavioral studies of subprimate organisms are covered in Category 04, *Biosciences*.)

Selective interest: Design of man-machine systems, including controls, displays, and protective equipment; cybernetics and bionics; performance of humans and lower primates under stress.

Negative interest: Typical medical, surgical, radiological, gynecological, etc., treatment not pertinent to space programs; common diseases unless aggravated by extreme environmental conditions; anesthesiology.

Input Subjects of Specific Interest

- Space cabin atmospheres, toxicity of oxygen and other potential breathing gas compositions, long-term physiological factors
- Physiological and psychological effects of flight, either in atmosphere or space, on pilots, astronauts, and aerospace crews

- Effects of altered gravity, centrifugal motion, weightlessness, rotation, Coriolis forces, acceleration and deceleration; adaptation of inner ear
- Long-term confinement and isolation, social interaction in small groups, sensory deprivation
- Life support systems, water treatment and regeneration, oxygen regeneration
- Visual acuity in space, safety aspects of color vision, visual tracking
- Fabrics and protective clothing; long-wearing, abrasion resistant, fire resistant, applicable for wear in space cabins
- Human engineering
- Pressure and space suits
- Food storage, preparation, palatability, and acceptability, both for short-duration and long-duration flights; food preparation under weightlessness and space constraints
- Waste disposal
- Exercise and entertainment
- Microbiological aspects of humans, e.g., effect of weightlessness of internal micro-organisms
- Bioinstrumentation specific to humans, e.g., noninvasive blood flow measurement
- Extravehicular activity and work aids
- Selection, training, testing, and evaluation of performance of astronauts, pilots, and other members of flight crews
- Radiation effects on humans, simulated solar flares

CHEMISTRY

Includes chemical analysis and identification (e.g., spectroscopy). For applications see: 17 *Materials, Metallic*; 18 *Materials, Nonmetallic*, and 27 *Propellants*.

General definition: The fundamental science of the structure of matter and the composition of substances, their transformation, analysis, synthesis, and manufacture. *Hackh's Chemical Dictionary*. Julius Grant, ed., McGraw-Hill Book Co. Inc., New York, 3rd Edition, 1944, p. 188.

NASA Interest

Exhaustive interest: Chemistry of elements and compounds characteristic of NASA's space, planetary, astronomical, propulsion, and material interests under appropriate conditions; chemistry of aviation fuels and rocket propellants; low pressure and vacuum reactions; radiation chemistry of ion beams.

Selective interest: Chemical research on elements, materials, and reactions having less immediate relevance but still related to NASA's programs.

Input Subjects of Specific Interest

- All properties and reactions of potential cryogenic fuel materials, specifically liquid and slush hydrogen, liquid oxygen, liquid fluorine
- Combustion chemistry, flames, rocket plumes
- Gaseous and gaseous-solid reactions of elements in Earth and planetary atmospheres: oxygen, nitrogen, argon, carbon dioxide, water vapor, ozone, methane, ammonia; spectroscopy and absorption bands
- Low pressure gas reactions
- Compounds hypothetically present in planetary atmospheres and space, e.g., nitrogen oxides
- Analytical techniques for extreme conditions (high vacuum, or low temperatures, radiation fields)

- Chemical measurement of radiation
- Gas absorption models
- Oxygen regeneration and chemistry of related compounds, e.g., lithium peroxide
- Alkali metal vapors: cesium, potassium, rubidium, sodium
- Chemistry related to aerospace use of materials such as aluminium, beryllium, boron, boranes, lithium, magnesium, titanium

COMMUNICATIONS

Includes communications equipment and techniques, noise, radio and communications blackout, modulation telemetry, tracking radar and optical observation, and wave propagation. For basic research see: 23 *Physics, General*; and 21 *Navigation*.

General definition: Communications—The act of conveying information from one person or agency to another, except, in the military context, by direct unassisted conversation, correspondence, or through postal systems. A system of facilities used for communications, especially a system of electrical or electronic facilities. Telecommunication—Any transmission, emission, or reception of signals, signs, writing, images and sounds or intelligence of any nature by wire, radio, visual or other electromagnetic system. *Communications—Electronics Terminology Handbook*. Public Affairs Press, Washington, 1965.

NASA Interest

Exhaustive interest: All techniques and equipment specifically intended for the transmittal of data to or from aircraft, launch vehicles, space vehicles, communications and scientific satellites, lunar and planetary bases; ground based radar tracking and communication stations; tracking and data acquisition networks; and transmittal of data from aerospace related experiments.

Selective interest: Communication techniques and theory of potential interest to aerospace research and development.

Negative interest: Commercial telephone operations, unless related to aerospace communications; courier and messenger services.

Subjects of Aerospace Interest

- Antenna design and theory
- Communication blackouts
- Communication theory and coding
- Information theory
- Ionospheric effects on radio transmission
- Man-machine communications

- Microwave transmitters
- Multiplexers (Specific equipment is reported in Category 09, *Electronic Equipment*.)
- Radio noise suppression
- Signal generators and analyzers
- Radar techniques and theory
- Speech compression and analysis
- Tropospheric scatter
- Wave propagation
- Telemetry, particularly high-rate telemetry
- Whistlers

Types of Communication Networks and Systems

- Active communications satellites
- Apollo network
- Deep space network
- Manned space flight network
- NASA Communications Network (NASACOM)
- Passive communications satellites
- Satellite network
- Space Tracking and Data Acquisition Network (STADAN)
- Station Conference and Monitoring Arrangement (SCAMA)

COMPUTERS

Includes computer operation and programming, and data processing. For basic research see: 19 *Mathematics*.

General definition: A device capable of solving problems by accepting data, performing prescribed operations on the data, and supplying the results of these operations. Various types of computers are calculators, digital computers, and analog computers. In information processing, usually an automatic stored program computer. *American Standard Vocabulary for Information Processing*. Approved June 14, 1966. American Standards Association, Inc., New York.

NASA Interest

Exhaustive interest: Computer use and programming for aerospace operations, including launch, tracking, and on-board applications; processing data on the operation and test of aeronautical and aerospace vehicles and components.

Selective interest: Computer applications in the coding and processing of information on topics of possible aerospace interest.

Negative interest: Computer programs and equipment for routine business and commercial activities, census-type listings, and nonaerospace data tabulation; analog computers and numerical control in routine industrial operations.

Specific Input Items

- Adaptive computers
- Airborne and spaceborne computers
- Automatic film digitizers
- Computer-aided design
- Computer components having long life, compactness, ruggedness, and unusual features
- Computer logic systems

- Computer memory devices having unique features: read-only memories, list processors
- Computer repairability: self-repairing computers
- Coding techniques
- Data acquisition, signal cleanup, editing, as done by computer
- Data management systems
- Pattern recognition
- Peripheral equipment, such as remote terminals, large capacity storage, plotters
- Programming languages
- Programs for all things of NASA interest
- Hybrid computers, and analog computers in aerospace use
- Fluid and pneumatic computers

ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 *Electronics*. For related information see also: 07 *Communications* and 21 *Navigation*.

General definition: Practical application of electronics is made through such devices as vacuum tubes, cathode-ray tubes, photoelectric cells, transistors, and the like. Comment under "electronics" in *The Second Aerospace Glossary*. W. A. Heflin, ed. Aerospace Studies Institute, Air University, 1966.

NASA Interest

Exhaustive interest: Research, development, design, testing, performance, operation, or control of devices, operating through the action of electrons, that have specific application to aeronautical and space vehicles and equipment, launch, research, and testing facilities, and the equipment used in these. (Electronic devices and equipment used in biological research and biotechnology may be reported in Categories 04 and 05, respectively, and in other categories if particularly related to the category subject.)

Selective interest: Research, development, design, performance, operation, or control of electronic devices having a potential use in aerospace activities or under extreme or unusual conditions or environments.

Negative interest: Commercially available electronic equipment and research and development on electronic devices having no relevance to aerospace interests.

Specific Devices of Potential Interest

- Antennas and arrays, where the emphasis is on the construction itself rather than the communications aspect, as in Category 07, *Communications*
- Capacitors
- Electrical insulation
- Electrical properties of materials

- Electroluminescent displays other than computer-related
- Electron-beam devices
- Electron tubes
- Electronic packaging
- Electronic test equipment
- Field-effect transistors
- Inductors
- Molecular gyros
- Negative resistance devices
- Oscillators
- Photon-activated switches
- Pulse modulators for electron beams
- Power amplifiers
- Power supply
- Semiconductor-type switches and devices
- Servomechanisms
- Transducers
- Thin-film triodes
- Thyratrons
- Transmission lines (if aerospace related)
- Tunnel diodes
- Vacuum tubes
- Vacuum switching and switchgear
- Waveguides

ELECTRONICS

Includes circuit theory, and feedback and control theory. For applications see: 09 *Electronic Equipment*. For related information see: Specific Physics Categories.

General definition: The branch of science and engineering concerned with the theory, design, and use of devices utilizing electron emission or absorption, such as electron tubes, cathode ray tubes, photoelectric cells, transistors, and the circuits in which these devices are used. *Encyclopedia Britannica*, 1969 Edition, Vol. 8, p. 246.

NASA Interest

Exhaustive interest: Design, analysis, synthesis, and optimization of electronic systems and circuits that have direct application in aeronautical and space research and technology.

Selective interest: Above aspects of electronic systems and circuits that have potential bearing on aerospace research, development, and technology or are related to electronics under extreme or unusual conditions.

Electronic Systems and Circuits of Potential Interest

- Cybernetics
- Control theory
- Integrated circuits
- Microcircuits
- Microminiaturization
- Network theory
- Printed circuits
- Servomechanism circuits and testing

CATEGORY 11

FACILITIES, RESEARCH, AND SUPPORT

Includes airports, lunar and planetary bases including associated vehicles, ground support systems, related logistics, simulators, test facilities(e.g., rocket engine test stands, shock tubes, and wind tunnels), test ranges, and tracking stations.

General definition: 1. A physical plant, such as real estate and improvements thereto, including buildings and equipment, which provides the means for assisting or making easier the performance of a function. 2. Any part or adjunct of a physical plant, or any item of equipment which is an operating entity and which contributes or can contribute to the execution of a function by providing some specific type of physical assistance. 3 An activity which provides a specific kind of operating assistance to naval, ground, or air forces thereby facilitating any action or operation. *Air Force Glossary of Standardized Terms and Definitions*. Air Force Manual AFM 11-1. Dec. 16, 1963. Department of the Air Force.

NASA Interest

Exhaustive interest: All aspects of airports and airways except routine commercial operations; tracking and communications stations and networks; test facilities of direct interest to aerospace activities, including rocket test stands, wind tunnels, and shock tubes; launch facilities; transportation vehicles and systems having direct application to the movement of aerospace equipment of such as launch vehicles and their components; lunar and planetary bases and mobile vehicles.

Selective interest: Design of research, development, and test laboratories having potential interest to aerospace activities; specialized equipment to generate unusual or extreme conditions of temperature, pressure, magnetic fields, etc.; particle accelerators having potential relevance to aerospace nonchemical propulsion or stationkeeping. (Nuclear reactor, radiation, and radioisotope facilities are reported in Category 22, *Nuclear Engineering*.)

Negative interest: Administrative and housekeeping functions at supporting facilities, commonly available instrumentation and equipment systems, commercial equipment not developed specifically for aerospace use.

Input Subjects of Aerospace Interest

- Accelerators of potential interest to aerospace activities
- Airports and airways, control towers, lighting, runway surfaces
- Automatic picture transmission system ground stations
- Checkout systems
- Clean rooms other than sterilization aspects (reported in Category 04, *Biosciences*)
- Deep space instrumentation facilities
- Engine test blocks and stands
- Extraterrestrial bases and surface exploration vehicles
- Environmental testing facilities
- Flight simulators
- Ground support equipment
- Launch facilities
- Launching pads and bases
- Lunar and planetary bases (fixed structures and vehicles)
- Lunar gravity simulation facilities
- Lunar roving vehicles
- Mobile lunar laboratories
- Pavement grooving and surfacing
- Remote launch monitoring facilities
- Research facilities
- Rocket test pads (Nuclear rocket test facilities are listed in Category 22, *Nuclear Engineering*.)
- Shock tubes and tunnels
- Simulators for aerospace equipment
- Solar simulators, space simulators, spacecraft simulators, space flight simulators
- Special vehicles for bases and transportation of aerospace equipment

- Storage facilities for fuels and cryogenic materials
- Test ranges and facilities
- Tracking stations
- Wind tunnels

CATEGORY 12

FLUID MECHANICS

Includes boundary-layer flow, compressible flow, gas dynamics, hydrodynamics, and turbulence. For related information see also: 01 *Aerodynamics* and 33 *Thermodynamics and Combustion*.

General definition: The analysis of forces and motions of liquids and gases . . . *Fluid Mechanics*. A. Gillrech (University of Arkansas). Wadsworth Publishing Co., Inc., Belmont, Calif., 1965. Fluid mechanics is the study of the behavior of fluids at rest and in motion. *Fluid Dynamics*. R.H.F. Pao (Rose Polytechnic Institute). Charles E. Merrill Books, Inc., Columbus, Ohio, 1967.

NASA Interest

Exhaustive interest: Studies on the forces, flow, and mechanical properties of fluids having specific relevance to aerospace interests, or fluids under conditions encountered in aircraft, spacecraft launch vehicles, or support facilities. (Investigations pertinent to astronomical, solar, and stellar environments are placed in Category 30, *Space Sciences*; boiling and heat transfer aspects of fluid mechanics and are found in Category 33, *Thermodynamics and Combustion*.)

Selective interest: Investigations dealing with forces, flow, and mechanical properties of fluids at rest, in equilibrium or in motion having potential application to aerospace research, development or applications, or under unusual or extreme conditions.

Negative interest: Flow of fluids over weirs or in open channels; flow of water in natural waterways and irrigation of agricultural lands, unless related to geophysical and remote sensing studies (see Category 13, *Geophysics*); flood control techniques, measures, or equipment, unless related to remote sensing; flow or pressure losses on common plumbing fixtures; flow of gases in mains.

Subject Areas of Particular Interest

- Boundary layer studies (For purely aerodynamic applications, see Category 01, *Aerodynamics*; for boundary layer thermal effects and combustion, see Category 33, *Thermodynamics and Combustion*.)
- Cavitation

- Effects of baffles, jets, and nozzles on fluid flow
- Flow measurement techniques (Specific instruments are placed in Category 14, *Instrumentation and Photography*.)
- Flow of liquids in, into, and out of tanks, tubes, and pipes
- Gravitational and acceleration effects
- Hydrostatics, hydraulics, and hydrodynamics
- Laminar (viscous), turbulent, transitional, and unsteady fluid flow
- Liquid sloshing and settling in tanks
- Mixing of gases and fluids in streams and jets
- Pressure losses in fittings used in aerospace hydraulic and pneumatic systems

GEOPHYSICS

Includes aeronomy, upper and lower atmosphere studies, oceanography, cartography, and geodesy. For related information see also: 20 *Meteorology*, 29 *Space Radiation*, and 30 *Space Sciences*.

General definition: The science of the earth with respect to its structure, composition, and development. Geophysics is a branch of experimental physics dealing with the Earth, including its atmosphere and hydrosphere. It includes the science of dynamical geology and physical geography, and makes use of geodesy, seismology, meteorology, oceanography, magnetism, and other earth sciences in collecting and interpreting earth data. *Dictionary of Geological Terms*. Prepared under the direction of the American Geological Institute. Doubleday and Co., Inc., Garden City, N.Y., 1962.

NASA Interest

Exhaustive interest: Earth resources as revealed by aircraft, satellite, and manned spacecraft observations, including agricultural, forestry, mineral, water, marine, economic, and cultural resources; observation of natural phenomena; oceanology; upper atmosphere and ionosphere; geomagnetism and gravitational field of the earth; geodesy and geology where specifically related to aerospace studies. (Remote sensors, and photographic and geophysical instrumentation are reported in Category 14, *Instrumentation and Photography*.)

Selective interest: Aspects of cartography, geodesy, geology, and marine science having potential application to earth resource, upper atmosphere, and geophysical studies of aerospace interest.

Negative interest: Surface surveys of geographic or geodetic points; surface or seismic prospecting for oil, specific minerals, or precious metals or stones; laboratory assaying processes or records; geological investigations not having potential relevance to ground truth, remote sensing, or earth structure and evolution; paleontology other than early indications of development of life.

Specific Subjects of Interest

- Aeronomy (physics, chemical composition, and chemical reactions of the upper atmosphere)

- Agricultural crops and land as remotely observed; optical, radar, and infrared reflectivity and signatures
- Airglow
- Aurora
- Cartography of earth surface
- Cultural resources as revealed by remote sensing, e.g., urban development, traffic patterns.
- Earthquake effects by remote sensing and satellite observation
- Geodesy (definition of size and shape of the Earth and the vector properties of its gravitational field)
- Gravitational effects, fields, equations, potential, and theory (Gravitational theory and relativity as applied to cosmology are reported in Category 30, *Space Sciences*.)
- Hydrology and water resources as revealed by remote sensing
- Ice surveys
- Ionosphere
- Origin of the Earth
- Orography
- Petrography
- Volcanoes as observed remotely

INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

General definition: Designing, manufacturing, and utilizing physical instruments or instrument systems for detection, observation, measurement, automatic control, automatic computation, communication, or data processing. Loosely, the term instrumentation is also used for the ensemble of instruments and auxiliary equipment used in an experiment, test, or process. Instrumentation involves not only the design of individual instruments and components but also their integration with auxiliary or associated devices into instrument systems. *Instrumentation*. W. A. Wildhack (National Bureau of Standards). In McGraw-Hill Encyclopedia of Science and Technology. McGraw-Hill Book Co., Inc., New York, 1960.

NASA Interest

Exhaustive interest: Design, composition, arrangement, installation, and use of devices for detecting, measuring, recording, telemetering, processing, or analyzing values or quantities characterizing an environment, flight, flight vehicle, or other experimental phenomena encountered in aerospace research or technology. In photography, techniques or equipment for making or recording visual observations, or recording images made by radiations beyond the visual. The visual observations may be those made for tracking or recording the performance of aircraft; tracking or recording the positions of planets and other celestial bodies, including Earth; recording unusual atmospheric or space phenomena; or recording or analyzing materials or substances used in aerospace vehicles or space research.

Selective interest: Aspects of instrumentation that present advanced or unusual features or apply to extreme environments and conditions of test or operation.

Negative interest: Commercial off-the-shelf instruments for general use; photographic equipment used for artistic or commercial purposes with no documentary value.

**Instruments for Measurement of the Following
Quantities Are of Aerospace Interest**

- Attitude or position of aerospace vehicles
- Earth surface phenomena, including optical, microwave, and infrared reflectivity and signatures of vegetation, sea surface, beaches, soil, rocks, paved surfaces, etc. (See Category 13 for discussion of earth resources.)
- Extremely weak magnetic fields
- Emissivity
- Extremely short-duration phenomena
- Fluid flow
- Gas velocity and density at high pressure or high velocity
- Micrometeoroid impact and characteristics
- Physiological characteristics
- Planetary atmospheres
- Properties of gases at high temperatures
- Quantitative radiometry
- Radiant energy
- Radiative heat flux
- Solar wind characteristics and solar radiation
- Spectral emission and absorption in gases
- Submillimeter wavelength electromagnetic power
- Ultrahigh vacuum
- Upper atmosphere characteristics

Specific Instrumentation and Photographic Equipment Types

- Ablation sensors
- Alarm systems, e.g., for cryogenic liquid systems
- Altimeters
- Anemometers
- Astrophysical instruments
- Biomedical and bio-electronic instrumentation
- Cameras, lenses, filters
- Darkroom equipment and photographic papers and processes for special processing (other than routine commercial processing)
- Electrical optical systems
- Gamma ray detectors, particularly for low-energy gamma rays
- Interferometers
- Ion mass spectrometers
- Microscopes other than commercially available
- Micrometeoroid sensors
- Multimode sensors
- Optical imaging systems
- Phototheodolites
- Physiological monitoring devices, including electroencephalographs
- Pressure transducers
- Shock tube instrumentation

- Short wavelength radiation detectors
- Spectral analysis instruments
- Spectrophotometers
- Spectroscopes
- Strain gage instrumentation for test facilities
- Telescopes
- Test devices, e.g., eddy current, x-ray, and neutron and radiography, and other nondestructive testing techniques
- Two-gas sensors for control of space cabin atmospheres
- Videcon cameras
- Wind tunnel instrumentation
- Other measuring instruments for gyroscopic, electric, electronic, mechanical, and pneumatic devices

CATEGORY 15

MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

General definition: There is no simple definition of a machine. *Cowles Encyclopedia of Science, Industry and Technology*. 1967, p. 428. Components of a machine include "both structural members used to position and support and members used to transfer motion and energy." *Harper Encyclopedia of Science*. 1967, p. 689. A process is "a series of steps leading to a certain end." *Bobbs-Merrills's Modern Science Dictionary*. 1959, p. 561.

NASA Interest

Exhaustive interest: Tools, machine parts, fabrication procedures, testing and maintenance methods, and quality control techniques specifically applicable to aircraft, space vehicles, launch vehicles, supporting facilities and other aerospace applications; space tools.

Selective interest: Design, fabrication and performance of individual parts of potential use in aerospace equipment, and new methods of manufacture, quality control, materials handling, inspection and durability.

Input Processes of Specific Interest

- Aluminizing
- Assembly tools
- Bonding
- Brazing
- Carburizing
- Casting

- Cleaning
- Cladding
- Coating
- Critical machining methods
- Diffusion bonding
- Electrodeposition
- Electron beam melting
- Explosive forming
- Extrusion
- Forging
- Friction
- Gas pressure bonding
- Heat treating
- Honeycomb machining
- Impact testing
- Joining
- Lubrication
- Machining
- Material forming and fabricating
- Nondestructive testing
- Plasma spraying
- Powder metallurgy

- Recrystallization
- Rolling
- Sintering
- Special fasteners
- Special tools, dies, and fixtures
- Swaging
- Ultrapurification
- Vacuum arc melting
- Vacuum adhesion
- Vapor deposition
- Wear
- Welding

Types of Machine Elements of Interest

- Bolts
- Screws
- Studs
- Rivets
- Washers
- Hooks
- Couplings
- Bearings
- Clutches

- Drives
- Gears
- Gaskets
- Cams
- Springs
- Pumps
- Filters
- Pipe fittings
- Valves
- Seals
- Turbine blades

MASERS

Includes applications of masers and lasers. For basic research see: 26
Physics, Solid-State.

General definition: Maser—A device used for the amplification or generation of radio waves, usually in the microwave region. A device analogous to the maser, but which operates at optical frequencies, is called the laser. The maser takes its name from . . . the descriptive phrase, “microwave amplification by stimulated emission of radiation.”
Encyclopaedia Britannica, 1966 Edition, Vol. 14, p. 1009.

NASA Interest

Exhaustive interest: Applications and fundamental studies directly bearing on aerospace use, particularly in space communication, optical radar, industrial type applications such as drilling and welding of electronic parts, and space tracking and navigation.

Selective interest: Fundamental research and theory of masers and lasers, new types of lasers and laser action.

Negative interest: Laser medical and surgical use unless related to specific aerospace disorders.

Input Subjects of Potential Interest

- Laser astronomy
- Laser radar
- Laser probing of the atmosphere
- Laser detection and warning of air turbulence
- Energy transfer in laser materials
- Laser radiation
- Laser optics; coherent optical signal processors

- Quantum generators
- All types of lasers, including ruby, liquid, gas, solid state, etc.

MATERIALS, METALLIC

Includes cermets, corrosion, physical and mechanical properties of materials, metallurgy, and applications as structural materials. For basic research see: 06 *Chemistry*. For related information see also: 18 *Materials, Nonmetallic*; and 32 *Structural Mechanics*.

General definition: Materials—Substances used in technology, which have properties appropriate to practical purposes; they are engineered to achieve the best compromise of properties consistent with the inherent characteristics of their component forms of matter. *Air Force Glossary of Standardized Terms and Definitions*. Air Force Manual AFM 11-1. Dec. 16, 1963, Department of the Air Force. Metallic elements in general are distinguished from the non-metallic elements by their lustre, malleability, conductivity, and usual ability to form positive ions. *Handbook of Chemistry and Physics*. D. Hodgman, ed. the Chemical Rubber Publishing Company, Cleveland, Ohio, 1962.

NASA Interest

Exhaustive interest: Physical properties, metallurgy, testing, and other aspects of metals, alloys, and metallic compositions having demonstrated direct application to aircraft, space vehicles, rockets, launch vehicles, supporting facilities, and other devices such as antennas and telescopes.

Selective interest: Physical properties, applications, metallurgy, testing, and evaluation of any metals, alloys, and metal compositions having possible use in aerospace research or applications; methods of improving the properties of metals and alloys (with the exception of machining and forming processes, which are referenced in Category 15, *Machine Elements and Processes*); and unusual properties and studies under extreme conditions. (Metals and alloys involved in specific nuclear applications are referenced in Category 22, *Nuclear Engineering*.)

Negative interest: Properties and applications of architectural materials and heavy structural members, unless relevant to aerospace construction.

Input Subjects of Specific Interest

- Aluminum and its alloys

- Beryllium and its alloys
- Boron filaments
- Brass
- Bronze
- Cadmium plating
- Chromium coating
- Cobalt-base alloys
- Copper-aluminum alloys
- Copper alloys, seals, wire
- Copper cladding
- Crystals (metal)
- Germanium coatings
- Gold coatings
- Liquid metals
- Magnesium alloys
- Molybdenum alloys
- Nickel-base alloys
- Niobium alloys
- Porous metals used in transpiration cooling, e.g., iron-chromium-yttrium alloy
- Refractory metals and alloys
- Silver

- Steels and stainless steels
- Superalloys
- Tantalum alloys
- Titanium and its alloys
- Tungsten and its alloys
- Whiskers
- Zirconium alloys

Properties of Particular Interest

- Corrosion and stress corrosion (reference in Category 06, *Chemistry*)
- Crack propagation
- Creep strength
- Effects of adverse conditions, e.g. extreme temperatures (low or high); high vacuum, radiation, micrometeoroid impact
- Electrical properties
- Fatigue strength
- Hydrogen embrittlement
- Impact strength
- Metallography
- Surface properties
- Thermophysical properties
- Machinability, weldability (reference in Category 15, *Machine Elements and Processes*)

CATEGORY 18

MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials, e.g., plastics; and elastomers, hydraulic fluids, etc. For basic research see: 06 *Chemistry*. For related information see also: 17 *Materials, Metallic*; 27 *Propellants*; and 32 *Structural Mechanics*.

General definition: Materials—Substances used in technology, which have properties appropriate to practical purposes; they are engineered to achieve the best compromise of properties consistent with the inherent characteristics of their component forms of matter. *Air Force Glossary of Standardized Terms and Definitions*. Air Force Manual AFM 11-1. Dec. 16, 1963. Department of the Air Force. Nonmetallic elements are not malleable, have low conductivity and never form positive ions. *Handbook of Chemistry and Physics*. D. Hodgman, ed. The Chemical Rubber Publishing Company, Cleveland, Ohio, 1962.

NASA Interest

Exhaustive interest: Physical and mechanical properties, production, handling, testing, and evaluation of nonmetallic materials and compositions of demonstrated and direct interest to designers of aircraft, rockets, space vehicles, reentry vehicles, launch vehicles, and supporting facilities such as cryogenic tanks.

Selective interest: Research and development on nonmetallic materials having potential aerospace applications, studies under extreme conditions, unusual applications, new synthesis and production methods, and weight saving materials.

Negative interest: Routine developments in the plastics and ceramics industry.

Input Subjects of Specific Interest

- Ablation materials
- Abrasives
- Adhesives

- Barium films
- Boron-fiber impregnated tapes
- Ceramics
- Cleaners
- Coatings, e.g., thermal coatings to provide proper reflectivity of thermal and infrared radiation in space environment
- Coolants
- Damping materials
- Elastomers
- Epoxy polymers
- Enamel
- Fabrics (Clothing is referenced in Category 05, *Biotechnology*.)
- Fiberglass
- Fibers
- Foams
- Gasket materials
- Glasses
- Graphite
- Hydraulic fluids
- Insulation
- Lubricants
- Minerals
- Oils

- Paints
- Plastics
- Polymers, e.g., improved hydrogen-impermeable polymers for lining liquid hydrogen tanks
- Potting compounds
- Quartz
- Refractories
- Reinforcing fibers
- Rubber
- Sealants
- Silicon wafers
- Solvents
- Synthesis of very-long-chain polymers of extended flexibility life
- Tape
- Textiles
- Thermal control materials

Properties of Interest

- Effects of extreme temperatures (high and low), ultraviolet radiation, high vacuum, solar radiation, solar wind (low energy charged particles), cosmic rays, and high energy particles
- Impact strength
- Gas emission
- Gaseous diffusion

- Shear and tensile strength
- Stability
- Thermal effects

CATEGORY 19

MATHEMATICS

Includes calculation methods and theory, and numerical analysis. For applications see also: 08 *Computers*.

General definition: Abstract science related to logic and based on a fundamental process; it proceeds from a body of explicitly stated assumptions (axioms or postulates) and deduces from them statements (theorems) of relationship. *The Columbia Encyclopedia*, 1963, p. 1329.

NASA Interest

Exhaustive interest: Applied mathematics bearing directly on the problems of solutions, approximations, and numerical analyses encountered in any aspect of aerospace research, development, testing, evaluation, and operation, and the methods, theories, and models used in calculations and solutions. (Mathematical papers having a very specific relevance to a particular aerospace field of interest may be reported in the appropriate category, e.g., computer calculations in Category 08, orbits and trajectories in Category 30, structural mechanics in Category 32, and heat transmission in Category 33.)

Selective interest: Basic and applied mathematical methods and theories bearing on or having potential application to calculations and solutions of problems of aerospace interest.

Negative interest: Classic texts and instructional materials unless related to aerospace sciences, aerospace mechanics, or aerospace engineering.

Mathematical Subjects of Specific Interest

- Algorithms
- Approximations
- Bayesian statistics
- Boundary problems
- Convergence criteria

- Decision theory
- Deformation of elastic bodies
- Differential equations
- Dispersion analysis
- Dynamic programming
- Dynamic systems control
- Error estimation
- Function minimization
- Functional analysis
- Linear programming
- Mathematical models
- Mathematical programming
- Matrices
- Monte Carlo methods
- Nonlinear systems
- Numerical analysis
- Numerical integration
- Operations research
- Parameter estimation
- Pattern recognition
- Probability
- Relativity

- Reliability
- Second and higher order equations
- Stability theory
- Statistical techniques
- Stochastic processes and approximations
- Systems analysis
- Systems engineering
- Topology (if has a conceptual relationship to aerospace interests)
- Transient field problems
- Unified field theory

METEOROLOGY

Includes climatology, weather forecasting, and visibility studies. For related information see also: 13 *Geophysics* and 30 *Space Sciences*.

General definition: The science dealing with the atmosphere and its phenomena, especially as relating to weather. *Dictionary of Geological Terms*. American Geological Institute. Doubleday and Co., Inc., Garden City, N.Y., 1962.

NASA Interest

Exhaustive interest: Meteorological satellites and interpretations of their observations, systems of global meteorological observations and measurements, atmospheric structure studies and observations needed for weather forecasting, and measurements and studies related to support of aerospace operations and spaceflight missions, particularly to launch operations and recovery and to aircraft safety, including clear air turbulence.

Selective interest: Research and observations less directly related to aerospace activities but possibly contributing to understanding of the basic problems.

Negative interest: Daily reports of local weather not associated with systems or spaceflights; surface distribution of printed weather information through postal or messenger services.

Subjects of Specific Interest

- Global collection and distribution of meteorological data
- Flight tests of sensors and technology basic to the study of the atmosphere
- Development of World Weather System
- Interaction of various regions of the atmosphere
- Seasonal and temporal variations of large scale circulation
- Stratospheric and mesospheric structure and dynamics

- Synoptic scale circulation
- Solar influence on weather, i.e., long term, seasonal, diurnal and short term
- Gravity waves, tidal waves, hurricane and cyclone tracking
- Turbulent energy exchange between the mesosphere and thermosphere
- External energy inputs such as solar ultraviolet, aurorae
- Interactions between the neutral and charged media in the atmosphere
- Climatology, wind fields
- Studies of cloud pictures from satellites
- Analysis of cloud cover and patterns, interpretation of meteorological satellite observations
- Explanation of clouds and precipitation
- Experimental Inter-American Meteorological Network activities
- Weather forecasting, studies of thunderstorm activity and behavior
- Studies of visibility and optical phenomena in the atmosphere
- Electrical, acoustical, and thermodynamic phenomena of the atmosphere
- Meteorological results of sounding rocket experiments
- Studies of atmospheric motions in terms of fundamental equations of hydrodynamics or other systems of equations
- Studies of atmospheric constituents as related to their modifying influences on the weather
- Modification of the weather and atmosphere through artificial means
- Micrometeorology applicable to launch operations
- Fog dissipation

NAVIGATION

Includes guidance, autopilots, star and planet tracking, inertial platforms, and air traffic control. For related information see also: 07 *Communications*.

General definition: The practice or art of directing the movement of a craft from one point to another. *Dictionary of Technical Terms for Aerospace Use*. Wm. H. Allen, ed., 1965. NASA SP-7.

NASA Interest

Exhaustive interest: Research, development, and application of methods, systems, and equipment intended to plan and control the movement of aircraft or spacecraft from point to point; navigation satellites and equipment and systems to utilize artificial satellites for the navigation and guidance of aircraft, spacecraft, and ships; research and development of specific relevance to these concepts.

Negative interest: Dead reckoning systems, visual air piloting, navigation for local cross-country air travel, and navigation for small craft in coastal travel.

Input Subjects and Equipment of Specific Interest

- Satellites for air-sea navigation and for intercontinental air traffic control
- Systems for optimum routing of traffic
- Systems for collision avoidance or adverse weather avoidance
- All-weather, global position determination
- Interplanetary navigation and guidance
- Systems for space vehicle attitude control
- Lunar and planetary navigation and guidance systems for spacecraft
- Instrument landing systems

- Guidance and navigation design methodology, techniques, and procedures
- Inertial navigation systems
- Inertial sensors and measurement units
- Doppler navigation systems
- Stellar navigation systems
- Instrument navigation systems
- Spacecraft guidance systems
- Guidance systems for lunar or planetary landing
- Midcourse correction and guidance systems
- Star trackers
- Autopilots
- Passive sensors, trackers, and references
- Active electromagnetic radiators, sensors, and equipment for navigation
- Display devices and equipment for navigation information
- In-flight compensation
- Attitude stabilization
- Orbital vehicle guidance
- Range and angle measurement

CATEGORY 22

NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 *Physics, Atomic, Molecular, and Nuclear*. For related information see also: 03 *Auxiliary Systems* and 28 *Propulsion Systems*.

General definition: Nuclear engineering may be validly applied to the design, construction, testing, and operation of equipment that makes use of or relates to nuclear processes and materials—particularly fissionable elements and their by-products. Preface to *Introduction to Nuclear Engineering*. R. L. Murray. Prentice-Hall, Inc., Englewood Cliffs, N.J., 1964.

NASA Interest

Exhaustive interest: All aspects of reactor and radioisotope technology and nuclear engineering specifically intended for aircraft and space propulsion, auxiliary power for space vehicles, and power sources for lunar and planetary exploration.

Selective interest: Aspects of reactor technology and design and nuclear theory and engineering having potential relevance to aerospace propulsion and auxiliary power.

Negative interest: Central station, marine, process heat, desalination, and production reactors; applications of nuclear explosives; and isotope production and separation methods, feed materials, and radioactive material handling, unless related to the availability and production of nuclear materials for aerospace use.

Input Subjects of Potential Interest

- Specific nuclear propulsion and auxiliary power projects, including Rover, Nerva, Phoebus, Kiwi, SNAP, etc.
- Aircraft reactors
- Criticality and reactivity

- Control systems
- Cooling systems
- Economics of nuclear propulsion and auxiliary power
- Fuels
- Gas core reactors
- Propellant heating test units
- Safety and radiation hazards
- Radioisotopes and fission products as propulsion and auxiliary power, including design, fabrication, testing, and evaluation
- Irradiation test facilities if applicable to aerospace reactors or components
- Nuclear engine test stands and facilities

PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 *Space Sciences*. For related information see also: 13 *Geophysics*, 20 *Meteorology*, and 29 *Space Radiation*.

General definition: Physics can be defined as the branch of natural science that treats those phenomena of material objects included in the subjects of mechanics, properties of matter, heat, sound, light, electricity and magnetism, and molecular and atomic processes. It describes and correlates energy and radiation, and has sometimes been defined as the study of matter and energy. *Mechanics* is the science of the motions of material bodies, the forces which produce or change those motions, and the energy relations involved. *Cryogenics* is the production and study of phenomena which occur at very low temperatures, i.e., below about 80°K. *The Encyclopedia of Physics*. R. M. Besancon, ed. Reinhold Publishing Co., New York, 1966. *Acoustics*: The field of acoustics, as commonly understood, deals with the generation and propagation of mechanical vibrations in matter, the application of sound in various fields of science, and its effects on man. *Handbook of Physics*. E. U. Condon and Hugh Odishaw, eds. McGraw-Hill Book Co., Inc., New York, 1958. *Optics*: Narrowly, the science of light and vision; more broadly, the study of the phenomena associated with the generation, transmission, and detection of electromagnetic radiation in the spectral range extending from the long-wave edge of the x-ray region to the short-wave edge of the radio region. *McGraw-Hill Encyclopedia of Science and Technology*. McGraw-Hill Book Co., Inc., New York, 1966.

NASA Interest

Selective interest: Studies of macroscopic properties of matter and energy in the fields of acoustics, cryogenics, electricity, magnetism, mechanics, optics, or other areas of physics not included in other subject categories, that have potential application in, or in interpretation of, aerospace science and technology.

Subjects of Potential Interest

- Acoustic scattering and transmission
- Liquid gases, physical properties

- Liquid helium
- Light scattering and transmission
- Electrical and magnetic properties of elements, compounds, and materials
- Ultrasonics

PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular, and nuclear physics. For applications see: 22 *Nuclear Engineering*. For related information see also: 29 *Space Radiation*.

General definition: The divisions or branches of modern physics are made in accordance with particular types of structures in nature with which each branch is concerned. Thus elementary-particle or ultra-high-energy physics is the most recent branch and is concerned with understanding the properties and behavior of elementary particles as such, and more particularly of the heavy unstable particles—mesons, hyperons, and anti-particles—which are produced in collisions involving energies above 150,000,000 electron volts. The next branch in this classification is nuclear physics, which is concerned with associations of neutrons and protons forming the nuclei of atoms; their structure, properties, and energy states; reactions between nuclei, including scattering processes and radioactivity; and related phenomena such as the interaction of high-speed nuclear particles with matter. Atomic physics is concerned with the structure and properties of atoms as determined by the electrons outside the nucleus; the states of motion of these electrons including such topics as energy levels, angular momentum properties, and magnetic moments; and the absorption and emission of radiation by atoms. Continuing with this classification in ascending complexity there is molecular physics which is concerned with systems of atoms formed into molecules, the nature of intermolecular forces, chemical binding, vibration and rotation spectra of molecules, and the like. *McGraw-Hill Encyclopedia of Science and Technology*. McGraw-Hill Book Co., Inc., New York, 1966.

NASA Interest

Selective interest: Elementary particles, electrons, protons, neutrons, nuclei, atoms, and molecules and their properties and reactions that have potential bearing on aerospace research, development, and applications.

Subjects of Selective Interest

- Absorptive properties of materials for small particles and molecules
- Alpha particle group reactions
- Alpha particle scattering

- Atomic beam measurements
- Electron beams (If concerned with thermonuclear power or other plasma studies, report in Category 25, *Physics, Plasma.*)
- Electron dynamics
- Electron scattering
- Fission spectra
- High energy particles, pions, mesons, etc., fundamental properties (If pertinent to cosmic radiation, report in Category 29, *Space Radiation.*)
- Ion beams
- Ion dynamics
- Isotope properties
- Molecular beams
- Neutron kinetics, resonances, and transport
- Neutron spectra and flux measurement
- Nuclear structure
- Particle scattering
- Proton scattering
- Radioisotope properties

PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see also: 28 *Propulsion Systems*.

General definition: A group of hot atoms with their electrons removed is called a plasma. *The Neutron Story*. Donald W. Hughes, Doubleday Anchor, Garden City, N.Y., 1959.

NASA Interest

Exhaustive interest: Experimental and theoretical studies of the interactions of plasma particles with applied electrical and magnetic fields, and with measurement of plasma properties, having direct relevance to aerospace interests, such as accelerators for propulsion systems, reentry conditions and their simulation, astrophysical plasmas, conditions in shock tunnels, etc.

Selective interest: Production and properties of beams in high-energy accelerators and plasmas in thermonuclear power generation experiments that have a potential bearing on studies of plasmas in aerospace research and development.

Negative interest: Details of thermonuclear power devices not pertinent in propulsion, astrophysics, etc.

Plasma Phenomena of Potential Interest

- Astrophysical plasmas
- Boltzmann transport
- Collisions
- Conductivity, density, diffusion, mobility, temperature, and turbulence in plasmas
- Control
- Diagnostics

- Glow and arc discharge plasmas
- Instability
- Kinetic theory
- Low density plasma accelerators
- Magnetohydrodynamics
- Magnetoplasmas
- Microwave interactions
- Pinch effect
- Plasma acceleration
- Plasmadynamics
- Plasma enhancement
- Plasma jets
- Superheated plasmas
- Waves, wave radiation, and wave propagation in plasmas

CATEGORY 26

PHYSICS, SOLID-STATE

Includes semiconductor theory and superconductivity. For applications see: 16 *Masers*. For related information see also: 10 *Electronics*.

General definition: It includes those phenomena which are exhibited by materials in the solid state, with emphasis on electronic properties and their relations to the composition of crystalline substances and to energy levels in these materials. *The Encyclopedia of Physics*. R. M. Besancon, ed. Reinhold Publishing Co., New York, 1966.

NASA Interest

Selective interest: Physics, properties, behavior, and theory of electrical superconductors, insulators, semiconductors, conductors, crystal structure, and similar aspects of the solid state. (The fundamental science is covered in this category; practical applications may be reported in Category 09, *Electronic Equipment*, or in an appropriate category if specific to its interests, e.g., reactor radiation disruption of solids may be reported in Category 22, *Nuclear Engineering*.)

Specific Subjects of Interest

- Crystal defects in ionic materials
- Crystal growth
- Dielectric properties of semiconductors
- Electrical transport properties in solids
- Electron motion in conductors
- Electronic energy band structure and spectra in solids
- Electron paramagnetic resonance in semiconductors

- Energy gaps, conductivity, donors, acceptors, radiation effects in semiconductors
- Microstructures
- Neutron diffraction in solids
- Polarizability and magnetic effects in insulators
- Properties of rare earth ions
- Single crystals
- Solid phase equilibria (If interest is specifically metallic or ceramic, report in Categories 17 or 18, respectively.)
- Solid state circuits

PROPELLANTS

Includes fuels, igniters, and oxidizers. For basic research see: 06 *Chemistry* and 33 *Thermodynamics and Combustion*. For related information see also: 28 *Propulsion Systems*.

General definition: Any agent used for consumption or combustion in a rocket and from which the rocket derives its thrust, such as a fuel, oxidizer, additive, catalyst, or any compound or mixture of these; specifically a fuel, oxidant, or a combination or mixture of fuel and oxidant used in propelling a rocket. *Dictionary of Technical Terms For Aerospace Use*. Wm. H. Allen, ed., 1965. NASA SP-7.

NASA Interest

Exhaustive interest: Physical, chemical, thermodynamic, and combustion characteristics and handling of all substances having specific use in aircraft, launch vehicles, rockets, and space vehicles to develop propulsive or auxiliary thrust. (Investigations dealing with the combustion and thermodynamic properties of substances other than propellants are reported in Category 33, *Thermodynamics and Combustion*; nuclear propellants are reported in Category 22, *Nuclear Engineering*.)

Propellant Characteristics of Specific Interest

- Boiloff
- Burning rate
- Catalysts
- Chemical erosivity
- Combustion and combustion products
- Controllability of propellants
- Curing

- Decomposition kinetics
- Effects of vacuum on propellants
- Failure and failure criteria
- Fluid behavior in low or zero gravity
- Fuel grain shapes
- Freezing
- Processing characteristics
- Propellant mechanical properties
- Stress-strain behavior
- Storage and handling procedures
- Structural integrity
- Slush state
- Vaporization and diffusion

Types of Propellants and Related Substances

- Aircraft fuels
- Fluorine/oxygen propellants
- Liquid oxygen
- Oxidizers
- High energy propellants
- Gelled propellants
- Metal-loaded propellants
- Liquified petroleum gas (LPG)

- Monopropellants
- Liquid propellants
- Solid propellants
- Hybrid propellants
- Space storable propellants
- Hydrazine propellants
- Igniters
- Kerosene fuels and propellants

CATEGORY 28

PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 *Nuclear Engineering*. For basic research see: 23 *Physics, General*; and 33 *Thermodynamics and Combustion*. For applications see: 31 *Space Vehicles*. For related information see also: 27 *Propellants*.

General definition: Propulsion mechanisms provide a force which moves bodies that are initially at rest, changes a constant velocity motion or overcomes retarding forces when a body is propelled through a medium. There are two essential elements in any propulsive mechanism: the energy source and an energy conversion device to transpose the energy into the form most suitable for propulsion. *Rocket Propulsion Elements: an Introduction to the Engineering of Rockets*. Third edition. G.P. Sutton, John Wiley Sons, Inc., New York, 1963.

NASA Interest

Exhaustive interest: All air-breathing engines and chemical, electric, magnetohydrodynamic, hybrid, or other types of energy conversion suitable for propulsion or stationkeeping of aircraft, spacecraft, satellite, planetary probe, or other mechanism of aerospace interest. (Energy sources and propellants apart from the propulsion system are covered in Category 27, *Propellants*; nuclear propulsion systems are treated in Category 22, *Nuclear Engineering*; and applications in specific position-control, ground-based research and development, and spacecraft are reported in Categories 03, *Auxiliary Systems*; 11, *Facilities*; or 31, *Space Vehicles*.)

Negative interest: Propulsion ships, locomotives, other earthbound vehicles (except aerospace test vehicles such as rocket sleds).

Subjects of Specific Interest

- Aircraft engines, including piston, turbofan, turbojet, turboprop, turborocket, etc.
- Aircraft engine components, including afterburners, carburetors, cooling systems, cowlings, engine inlets, exhaust systems

- Aircraft propellers
- Electric, electrostatic, electrothermal, ion engines
- Engine noise suppression
- Fuel injectors, pumps, tanks, flow systems
- Gas turbines used for propulsion
- Hybrid propellant rocket engines
- Igniters
- Liquid and solid propellant engines
- Pulsejet engines
- Reciprocating engines (steam, gasoline, diesel, spark ignition, etc.) of aircraft interest
- Restartable rocket engines
- Superchargers
- Throttling systems
- Thrust vector control

CATEGORY 29

SPACE RADIATION

Includes cosmic radiation, solar flares, solar radiation, and Van Allen radiation belts. For related information see also: 13 *Geophysics*; and 24 *Physics, Atomic, Molecular, and Nuclear*.

General definition: Radiation—Energy radiated in the form of waves or particles (as . . . electromagnetic waves and corpuscular emissions that include alpha rays, beta rays, and neutrons released in atomic nuclear changes as well as cosmic rays.) *Webster's Third New International Dictionary*, Unabridged. G. & C. Merriam Co., Springfield, Mass., 1961.

NASA Interest

Exhaustive interest: Emission and propagation of energy, usually in the form of waves or particles, through space and the Earth's upper atmosphere, and the effects of such waves or particles on materials or equipment. (Effects of radiation on living objects are covered in Category 04, *Biosciences*; effects of ground-based radiation sources, such as nuclear reactors, radioisotopes, x-ray equipment, or accelerators, on materials or equipment are covered in Category 22, *Nuclear Engineering*.)

Subjects of Specific Interest

- Artificial radiation belts
- Cosmic radiation
- Electromagnetic radiation encountered in space other than man-made (Electromagnetic radiation of communication interest is covered in Category 07, *Communications*; radiowave emission by planets, solar, stellar, or galactic radio sources is covered in Category 30, *Space Sciences*.)
- Galactic radiation
- Hazards from space radiation to equipment and materials

- Protection of aerospace equipment from space radiation
- Proton belts
- Solar flares and solar radiation other than radio wave emission
- Solar wind
- Stellar radiation
- Van Allen belts

CATEGORY 30

SPACE SCIENCES

Includes astronomy and astrophysics, cosmology, lunar and planetary flight and exploration, and theoretical analysis of orbits and trajectories. For related information see also: 11 *Facilities, Research, and Support*; and 31 *Space Vehicles*.

General definition: A special discipline concerned with the techniques and methods of obtaining knowledge on space and on the particles, bodies, structures, and photons that move in space, as well as with the classification of the knowledge obtained. *The Second Aerospace Glossary*. W. A. Heflin, ed. Aerospace Studies Institute, Air University, 1966. The space sciences may be defined as those areas of science to which new knowledge can be contributed by means of space vehicles, i.e., sounding rockets, satellites, and lunar and planetary probes, either manned or unmanned. Preface to *Sourcebook on the Space Sciences*. S. Glasstone. D. Van Nostrand Co., Inc., Princeton, N.J., 1965.

NASA Interest

Exhaustive interest: Location, magnitude, luminosity, size, mass, density, surface, temperature, atmosphere, origin, evolution, orbit, and physical and chemical properties of lunar, planetary, stellar, and other celestial bodies; present structure, origin, and evolution of the universe; sciences necessary for lunar and planetary exploration; results of such exploration; and theoretical analysis of the orbit and trajectories of spacecraft of celestial bodies.

Subjects of Specific Interest

- Asteroids
- Astrodynamics
- Astronomical models
- Astronomical observations
- Astronomical observatories

- Astronomical photometry and spectroscopy
- Astrophysics
- Celestial geodesy
- Celestial mechanics
- Comets
- Cosmic, interplanetary, and interstellar dust and gases
- Cosmic gases
- Cosmogony and cosmology
- Galaxies and metagalaxies
- Gravitational effects
- Interplanetary flights
- Lunar or planetary flights, landing sites, bases and surface studies
- Meteors, meteoroids, meteorites, micrometeorites, micrometeoroids
- Natural satellites
- Optical and photographic astronomy
- Orbit perturbations
- Planets
- Postflight analysis
- Pulsars
- Quasars
- Radar astronomy
- Radio astronomy

- Relativity
- Selenography
- Selenology
- Solar structure
- Space missions
- Tektites
- Trajectory analysis

SPACE VEHICLES

Includes launch vehicles, manned space capsules, clustered and multistage rockets, satellites, sounding rockets and probes, and operating problems. For basic research see: 30 *Space Sciences*. For related information see also: 28 *Propulsion Systems* and 32 *Structural Mechanics*.

General definition: A structure, machine, or device . . . designed to carry a burden through space. Adapted from *Dictionary of Technical Terms for Aerospace Use*, Wm. H. Allen, ed., 1965. NASA SP-7.

NASA Interest

Exhaustive interest: Design, research, development, testing, evaluation, and performance of any launch vehicle, spacecraft, combination of launch vehicle and spacecraft, propulsion system, auxiliary system, or component, and all operating procedures and problems related to peaceful uses of space vehicles.

Negative interest: Design and performance of military weapons and warheads, military characteristics of weapons and their effects, performance and effectiveness of anti-missile missiles, and pyrotechnic rockets used for displays and festivals.

Input Subjects of Specific Interest

- Space vehicle handling and preparation for launching
- Countdown and space vehicle launching operations
- Space vehicle flight operations, and extravehicular activity and operations
- Landing and recovery of spacecraft on Earth and on other celestial bodies
- Maintenance of space vehicles
- Plans, descriptions, and results of space missions

- Launch and flight performance data
- Foreign space vehicles and space programs
- Payload and equipment carried on specific space vehicles
- Space vehicle stability, control, vibration, flutter, and flight dynamics
- Design of space vehicles, propulsion units, tanks, components, systems
- Design of seats and couches for space vehicles
- Separation and staging techniques for stages of space vehicles
- Space vehicle safety problems
- Research on the effects and elimination of space vehicle fires
- Effects of space radiation on space vehicles and their components

Types of Space Vehicles of Interest

- Launch vehicles, manned and unmanned spacecraft
- Combinations of launch vehicles and spacecraft
- Clustered and multistage rockets
- Sounding rockets, space probes, and scientific satellites
- Reentry vehicles and lifting bodies
- Space stations and space laboratories
- Missiles and rockets (except military characteristics and weapons systems)

STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter, inflatable structures; and structural tests. For related information see also: 17 *Materials, Metallic*; and 18 *Materials, Nonmetallic*.

General definition: Mechanics is the branch of physics which deals with the effects of forces upon [structural] bodies at rest or in motion. *The International Dictionary of Physics and Electronics*. D. Van Nostrand Co., Inc., New York, 1956. [Note: The modifier *structural* has been added to limit the *bodies* involved to solid structures and structural elements.]

NASA Interest

Exhaustive interest: Analysis, calculation, test, measurement, or discovery of forces, pressures, stresses, or loads, including any resultant strain, deformation, or other static or dynamic phenomena, encountered by the structure or structural elements of specific aircraft, spacecraft, launch vehicles, ground support, or other equipment used in aerospace science or technology; related research and investigations of obvious applicability to aerospace structural design.

Selective interest: Investigations and applications in the same areas of structural mechanics having a possible bearing on, or application to, aerospace structural design, such as new structural testing methods and structural theory.

Negative interest: Studies and analyses of structures too heavy to be airborne or spaceborne and with no clear value as ground support structures.

Input Topics of Potential Interest

- Statics, kinetics, kinematics
- Stress analysis, structural analysis
- Bending
- Buckling and post-buckling properties of structures

- Tension, compression, shear, and combined loads
- Shock, impact, thrust, or energy-absorption
- Flutter, vibration, fatigue
- Elasticity, plasticity, plastic stresses, creep
- Stress concentration, fracture mechanics

Pertinent Structure and Structural Element Types

- Complete airframes or spacecraft structures
- Components of aircraft or space vehicles, such as wings, landing gear
- Beams or columns
- Booms
- Expandable or inflatable structures
- Filament-wound cylinders
- Panels
- Plates
- Rings, cylinders, shells, cones
- Tanks, connectors
- Temperature-insulating or energy-insulating structures
- Welded or bolted joints

THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 *Fluid Mechanics* and 27 *Propellants*.

General definition: Thermodynamics is the science which deals with energy and its transformations, and with the relationships between the properties of substances . . . Thermodynamics deals only with the macrostructure of matter and does not concern itself with events happening at the molecular level. *Thermodynamics*. E.F. Obert and R.A. Gaggioli. McGraw-Hill Book Co., Inc., New York, 1963. Combustion is a branch of science and technology that deals with the liberation and use of energy evolved during the reaction of chemical species. In its most common usage, combustion describes the process of rapid heat liberation, and is commonly associated with appearance of luminous flames. *The Encyclopedia of Chemistry*. George L. Clark, ed. Reinhold Publishing Co., New York, 1966.

NASA Interest

Exhaustive interest: Research and development on heat transfer and combustion processes of direct relevance to aircraft, rocket, and launch vehicle propulsion, reentry, spacecraft cooling, and thermodynamic properties of elements, compounds, and substances found in aerospace science and technology.

Selective interest: Research dealing with the processes, mechanics, and materials by which heat is transferred to or through any medium, characteristics of flames and other combustion products, and other thermodynamic processes having a potential bearing on aerospace activities.

Negative interest: Combustion investigations that are not pertinent to the propellants, oxidizers, or combustibles having potential use in aerospace vehicles; heat transfer that is not related to materials or processes of aerospace interest.

Input Subjects of Interest

- Aerodynamic heat transfer
- Ablation and ablative materials studies

- Atmospheric heating
- Boiling
- Boundary layer dynamics
- Burning rates
- Combustion characteristics
- Combustion instability
- Combustion kinetics
- Combustion phenomena
- Combustion products
- Detonation
- Flames and flame propagation
- Gaseous-film cooling
- Heat exchanger performance
- Heat sinks
- Heat transfer
- Heat transfer simulation
- Heat shield characteristics
- Induction heating
- Ignition studies
- Radiative heat flux
- Radiation sources
- Radiator characteristics

- Rocket combustion
- Rocket plumes
- Refrigeration
- Thermal characteristics of components and materials
- Thermal conductivity
- Thermal networks
- Thermal radiation
- Thermodynamic properties
- Transpiration cooling

CATEGORY 34

GENERAL

Includes reports of a broad nature related to industrial applications and technology, and to basic research; defense aspects; law and related legal matters; and legislative hearings and documents.

NASA Interest

Exhaustive interest: Air and space law; international cooperation in space; management theories, principles and techniques applicable in the aerospace field; social and economic aspects of space programs; documentation and information technology in the aerospace field; and aerospace scientific and technical reports and publications dealing substantially with more than one subject within the scope of collection.

Selective interest: Management science, operations research, systems analysis, economic theory having potential relevance to aerospace operations; information science and documentation practices having a potential bearing on the storage, retrieval, and bibliographic control of aerospace reports and published literature.

Subjects of Potential Interest (exhaustive if specifically aerospace related)

- Aerospace histories and forecasts
- Aerospace management and philosophy
- Congressional hearings and legislation on aerospace subjects; research and development, and information science
- Contract management
- Economic impact of aerospace programs
- Educational impact of aerospace advances
- Information handling
- Legal aspects of aerospace activities

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