The Scope of Aerospace

To gain an overview and a comprehensive understanding of aerospace, it must first be defined both as an environment and as a field of activity.

As an environment . . . aerospace includes that total expanse extending upward and outward from the surface of Earth . . . including atmosphere, space, and the transition zone between.

As a field of activity . . . it includes both aeronautics and astronautics . . . with national and international commitments and resources being channeled into three major areas of emphasis, with obvious overlap among them:

1) national security—pertains to the military and other governmental agencies concerned with the welfare and defense of nations.

2) space exploration—pertains to the scientific research into a new environment and the application of this research to our daily lives.

3) worldwide transportation and communications network—pertains to the attempt to bring all peoples of the world into close proximity through the use of commercial airlines and the advancement of private aviation.

The editors of Above and Beyond, The Encyclopedia of Aviation and Space Sciences, were faced with the task of creating a comprehensive reference work which would be of value to the classroom teacher. The basic organization of this project required breaking down the broad spectrum of aerospace into a manageable form and unifying context. Research in close cooperation with major agencies and several recognized authorities led to the establishment of ten functional categories which describe the field. The close interrelationship between astronautics and aeronautics makes it necessary to treat them as a continuum within each category.

These ten definitive categories are:

- The environment
- The basic sciences in aerospace
- People and events in aerospace development
- Man in flight
- Aerospace vehicles
- Aviation and space operations
- The art of flight
- Communications and control
- Manufacturing and facilities
- Aerospace and society

The charts on the following pages broadly outline the subject areas of each category. Position in the chart does not necessarily indicate the relative significance or magnitude of a specific subject, but rather its context. To the right of each chart appears an alphabetical list of some typical related topics as they appear in the encyclopedia. These same topics are also shown in a typical curriculum-area context in a section following the charts.
AEROSPACE

The aerospace realm is divided and subdivided into many regions depending upon a particular disciplinary viewpoint. Flight through the atmosphere and in space are quite distinct with a merging of the two in a zone that has some of the environmental characteristics of both.

Space (beyond 50 miles)

Phenomena of Near-Earth Space. The venture into space resulted in the discerning of many phenomena. These phenomena are sometimes called weather of space and must be considered in planning spaceflight, much the same as in atmospheric flight.

BASIC SCIENCES IN AEROSPACE

The basic sciences underlie all the activities of aerospace. They are often applied in new and unconventional ways and have forced the emergence of obscure branches of a basic science into surprising prominence, even to the point of creating new career fields. One interesting example is cryogenics.
Aerospace Education Defined

Should be distinguished from meteorology as the reporting, interpretation and evaluation of weather relating to the use of aircraft.

THE ART and TECHNIQUES OF FLIGHT

Aeronautical skills have grown from the trial and error techniques of pioneering aviators to precise control of today's sophisticated aircraft. The term "interface" has been coined to describe the interrelationship of a man, with his knowledge and capability, and the functioning of his vehicles. The two are a functioning unit. Aeronautics and aeronautics form a continuum. Conceptually, navigation, communications, environmental control, instrumentation, etc., are similar in both; but the degree of advancement and sophistication in aeronautics is considerable.

Aviation Weather
- Pilot training
- Flight technique and management
- Navigation
- Maneuvers
- Flight planning

Aeronautical skills
- Astronaut training
- Mission simulation
- Mission planning
- Mission activities

Astronautical skills
- Maps and charts
- Pilot equipment
- Manuals
- Reference materials

Aids to flight
- Test piloting
- Aerobatics
- Exhibition and demonstration flying
- Skydiving

Related activities

Avionics
- Air Traffic Control
- National Airspace System

Aviation

Radar

Radio Communications

Data Acquisition

Space

Cybernetics

Astronics
- Tracking system
- Guidance and Command

Science of Control and Communication Processes in Man and Machines

Air Traffic control
- Attitude control
- Automatic landing
- Avionics
- Bearing
- Communications satellites
- Computers
- Cybernetics
- Data acquisition and processing
- Doppler navigation
- Electronics
- Electromagnetism
- Flight plan
- Ground control approach
- Guidance and control systems
- Gyroscope
- Inertial guidance
- Information systems
- Instrument Flight Rules
- Lasers
- Microwave
- Morse code
- National Airspace System
- Navigation systems
- Navigation satellites
- Phonetic alphabet
- Radar
- Radio
- Radio communications
- Spaceflight principles
- Telemetry
- Television
- Tracking systems and networks
- Visual Flight Rules
Civil Aviation
Civil aviation relies upon aircraft as a means of rapid transportation with some specialized industrial uses such as crop dusting, fire fighting, traffic control where the three dimensional utility of the aircraft becomes important.

Military
Aerospace vehicles have become the backbone of modern warfare both offensively and defensively. Aerospace power is the modern counterpart of 18th century sea power.

Space Exploration
The international space programs have already begun to branch out from the mainstream effort of exploration and the gathering of scientific data. Major programs are underway to make use of space vehicles and space science to improve our way of working and living.
Man in flight (aerospace medicine)

Man has a very limited ability to adapt to the changing conditions as he flies higher and faster into an increasingly hostile environment which quickly requires a self-contained, artificially created atmosphere to sustain life.

People and events in development of aerospace

Modern aerospace has its roots in mythology and legend; however, its role as a meaningful part of our society has only developed during the past few decades.
Aerospace Education Defined

Aircraft

- Lighter than air
  - Airships
  - Balloons
- General aviation
- Air transports
- Military (High Performance)
- V/STOL
  - Rotary Wing
- Other
- Gliders

Ground-effect machines

Instruments and Controls

Aerospacecraft

- Aerospacecraft can be operated and controlled in both atmospheric and space flight. Examples are the X-15 and lifting bodies.

Flight Simulators

Propulsion Systems

- Reaction engines
  - Gas turbine
  - Rockets
  - Electric
- Reciprocating engines (Piston-Propeller)
- Other systems
- Fuels
  - Russian Programs
    - Vostok
    - Voskhod
    - Soyuz
  - American Programs
  - Mercury capsules
  - Gemini capsule
  - Apollo vehicles
  - Sounding Rockets
  - Satellites
  - Space probes
  - Lunar exploration
  - Planetary exploration
  - Liquid Fuel
  - Solid Fuel
- Air Breathing
- Missiles
- Bombs, guns, & cannons

Launch vehicles

Aerospace Weaponry

AEROSPACE VEHICLES

The hardware of aerospace is the great variety of aircraft, launch vehicles, spacecraft, weapons and related onboard equipment designed to perform specific tasks.
The technological achievements of aerospace must be viewed in the context of involvement and effect upon the world society to be understood in proper prospective.