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Remotely Piloted Vehicles
1974-July, 1980
(Citations from the International Aerospace Abstracts Data Base)

New Mexico Univ.
Albuquerque

Prepared for

National Technical Information Service
Springfield, VA

Sep 80

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CONTENTS

BIBLIOGRAPHIC INFORMATION

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Samuel C. Mauk.

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These citations from the international literature cover various aspects of remotely pilote vehicles. Included are articles concerning aircraft design, flight tests, aircraft control, cost effectiveness, automatic flight control, automatic pilots, and data links. Civil aviation applications are included, although military uses of remotely piloted vehicles are stressed. (This updated bibliography contains 224 citations, 43 of which are new additions to the previous edition.)

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ABSTRACT

JOURNAL **ORDER NUMBER** **TITLE** **AUTHOR(S)** **DATE OF PUBLICATION**

78A23667
Electrical Properties and Conduction Mechanisms of Ru-Based Thick-Film Cermet Resistors **PAGES IN ARTICLE**
A/Pike, G. E.: B/Seager, C. H.
Journal of Applied Physics, Vol. 48, Dec. 1977, p. 5152-5159. 18 pages.
ABS an investigation is made of the electrical condition mechanisms in thick-film (cermet) resistors based on ruthenium. The temperature dependence of conductance, measured from 1.2-400 K, shows a significant decrease in conductance at low temperatures and a shallow maximum of several hundred kelvin. The reversible conductance as a function of electric field from 0-28 KV/CM is also considered. Electrical transport properties are evaluated for metal oxide particles extracted from fired resistors. Attention is given to various conduction mechanism models uniform, uniform channel, nontunneling barrier, and tunneling barrier model. Based on these results, a refined tunnel barrier model is developed and compared to experimental results.
/*Cermets/*Electrical Resistivity/*Metal Oxides/*Resistors/*Ruthenium/*Thick Films

SUBJECT TERMS

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PRINT 12/4/1-224

80A31018

UTTL: Application of a ground based minicomputer system for real time, closed loop control of remotely piloted aircraft models used in stall/spin research

AUTH: A/MONTOYA, R. J.; B/JAI, A. R. CORP: Research Triangle Inst., Research Triangle Park, N. C.

Automatic Control Theory and Applications, vol. 7, Sept. 1979, p. 49-54. NASA-supported research.

ABS: The paper describes a minicomputer-based, real-time closed loop remote control system at NASA Langley outdoor facility which is used to determine the stall/departure/spin characteristics of high-performance aircraft. The experiments are conducted with 15% dynamically scaled, unpowered models that are dropped from 3000 m and ground controlled. The effects of time delays and sampling rates on the stability of the control system and the selection of digital algorithms to meet frequency response and real time constraints are examined. Also described is the implementation of the modular software for the flexible programming of multi-axis control laws.

MAJS: /*AIRCRAFT CONTROL/*FEEDBACK CONTROL/*GROUND BASED CONTROL/*MINICOMPUTERS/*REAL TIME OPERATION/*REMOTELY PILOTED VEHICLES

80A29674

UTTL: Communication to RPVs

AUTH: A/GIBBS, S. E.; B/DUNSMORE, M. R. B.

In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 23.1-23.10.

ABS: The various types of data links to RPVs are considered. The information to be transferred between the ground terminal and the RPV or between RPV and RPV depends largely on the type of mission. This imposes the largest constraint on the link design. Factors affecting RPV link data are discussed in terms of operational scenario, frequency allocation problems, signal or picture quality required to perform task, command and telemetry, integrated tracking, and electromagnetic interference and counters. Also discussed are special electronic components for RPVs.

MAJS: /*AIRCRAFT COMMUNICATION/*DATA LINKS/*GROUND STATIONS /*REMOTELY PILOTED VEHICLES/*TRANSMISSION EFFICIENCY

80A29673

UTTL: Microprocessors in a RPV system

AUTH: A/EAGLE, J. W.

In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979. Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 19.1-19.8.

ABS: The different roles played by RPVs in military systems are summarized, and the possible implementation of these roles with the aid of microprocessors is discussed. Some of the important design factors which must be considered are highlighted. The use of microprocessors in the application and testing of the RPV system is considered in general terms and their application in the context of a specific surveillance and target acquisition system is examined. Three clearly defined areas within an RPV system are considered: the air vehicle, the ground-based equipment, and the support services. Some of the problem areas are identified, and suggestions are made as to how these can be avoided.

MAJS: /*AIRCRAFT CONTROL/*AUTOMATIC TEST EQUIPMENT/* ELECTRONIC CONTROL/*MICROPROCESSORS/*REMOTELY PILOTED VEHICLES

80A29672

UTTL: Advanced developments in turbo machinery for use in small RPV engines

AUTH: A/CHEVIS, R. W.

In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979. Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 17.1-17.10.

ABS: The paper focuses on outlining recent aerodynamic developments in turbomachinery applicable to small RPV turbojets. The term small is assumed to apply to engines having air mass flows less than about 8 lb/s. Attention is given to the impact of aerodynamic developments on engine performance. The discussion suggests strongly that the application of advanced small compressor and turbine technology can considerably improve performance levels in small RPV turbojets without increase in complexity.

MAJS: /*AIRCRAFT ENGINES/*PROPULSION SYSTEM PERFORMANCE/* REMOTELY PILOTED VEHICLES/*RESEARCH AND DEVELOPMENT/* TURBOJET ENGINES

80A29671
UTTL: Design and test of mini-RPV demonstrator engines
AUTH: A/JOHNSON, E. T.; B/GOMEZ, J.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 15.1-15.7.
ABS: The design and testing of three 15-kW (nominal), two-cylinder, two-stroke demonstrator engines for use on mini-RPV aircraft are discussed. The objective is to develop the technological base for engines in the 15-kW class so that they would be available for RPVs as they enter engineering development. Specific goals of the mini-RPV demonstrator engine program are defined. Test results show that changes are required to improve durability, reliability, and maintainability. Test results for performance, altitude, noise, hot and cold starts, and electromagnetic interference are discussed.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*ENGINE TESTS/*LIGHT AIRCRAFT/*REMOTELY PILOTED VEHICLES

80A29670
UTTL: RPV aeronautical and support system Supporting Technology Programs
AUTH: A/STANTON, R. O.; B/SMITH, G. N.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 11.1-11.11. Army-supported research.
ABS: The paper discusses the six programs of the aeronautical and support systems area of the RPV Supporting Technology Program (STP). This program has three major areas: aeronautical and support systems; electrooptical systems; and data link and command systems. The six programs discussed concern propulsion, recovery systems, launch systems, fabrication techniques, servoactuators, and propeller acoustics. It is suggested that the STP will continue to be a valuable source of technology for future RPV systems.
MAJS: /*AERONAUTICAL ENGINEERING/*REMOTELY PILOTED VEHICLES /*SUPPORT SYSTEMS

80A29669
UTTL: Mini-RPV technology development
AUTH: A/LOWE, D. T.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 6.1-6.10.
ABS: The paper discusses the Mini-RPV Research and Development Program intended to develop RPV technology at low cost. The discussion covers the program background, aircraft design concepts, structural foam technology, avionic activities, vehicle recovery, and target strike investigations. Every attempt has been made to achieve acceptable performance at minimum cost. This program, begun several years ago, has resulted in the development of appropriate technology and has significantly helped in the positive display of total system capability.
MAJS: /*AIRCRAFT DESIGN/*AIRPLANE PRODUCTION COSTS/*REMOTELY PILOTED VEHICLES/*RESEARCH AND DEVELOPMENT

80A29668
UTTL: Use of a simulator in the development of a RPV system
AUTH: A/HELEREN, N. J.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Supplementary Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 4.1-4.7.
ABS: The concept of an RPV system simulator is being employed currently for SUPERVISOR, a medium-range surveillance and target acquisition system being developed for the British Army. The system uses a remotely piloted helicopter which carries an imaging sensor and is capable of relaying in real time the observed scene on the ground below to a ground control station. Attention is given to the aims and design of the SUPERVISOR System simulator. Care must be exercised that the use of the simulator is appropriate to the outputs required; otherwise, not only is the system itself likely to suffer but the credibility of the simulator to the topics it was designed to examine will also be questioned.
MAJS: /*AIRCRAFT CONTROL/*COMPUTERIZED DESIGN/*CONTROL SIMULATION/*REMOTELY PILOTED VEHICLES/*SYSTEMS ENGINEERING/*TARGET ACQUISITION

80A29666
UTTL: Antennas for RPV's
AUTH: A/WILLIAMS, N.; B/WRIGHT, P.; C/KEEN, K.; D/FOSTER, P. R.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 24.1-24.5.
ABS: Various antennas used in mini-RPV experiments are reviewed, and the development of a microwave antenna system for a secure data link is described. Considering antennas for an I band data link, coverage requirements for a vertically polarized antenna system

are summarized, and attention is given to the short range antenna. It is concluded that several antennas are needed to obtain acceptable performance and that the wing tips offered the best sites since they introduced the least obscuration.
MAJS: /*AIRCRAFT ANTENNAS/*MICROWAVE ANTENNAS/*REMOTELY PILOTED VEHICLES

80A29665
UTTL: Real time infra red reconnaissance for RPV's
AUTH: A/ARBUTHNOTT, J.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 22.1-22.15.
ABS: Infrared linescan systems for airborne surveillance by remotely piloted vehicles are described, which are suitable for day and night military use as well as civil applications such as the detection of oil slicks or the observation of areas along overland pipelines. An optical system with a small infrared sensitive detector at the focus is used to scan the ground by revolving a mirror at high speed; performance of such a system includes resolution of 1.5 milliradians and sensitivity better than 0.25 C. The use of an airborne real time display or real time transmission to a display in a ground station is also discussed, for which either dry processed paper recorders or an entirely electronic display system may be utilized.
MAJS: /*AERIAL RECONNAISSANCE/*INFRARED SCANNERS/*REMOTE SENSORS/*REMOTELY PILOTED VEHICLES

80A29664
UTTL: Stabilized surveillance payloads
AUTH: A/SCHASCHKE, E. G.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 21.0-21.6.
ABS: Stabilized sighting systems providing navigational assistance for remotely piloted vehicles are discussed, which use a directly coupled gyro/mirror technique together with a charge injection device camera. Two methods of sightline stabilization are considered: mirror stabilization, which utilizes gyro precession from torques; and direct point stabilization, wherein a solic state TV camera is mounted to the inner gimbal of a two degree of freedom gyro with the sightline parallel to the spin axis. Also considered are payloads such as the laser module, which is appropriate either for target designation or range finding, and a simple surveillance system consisting of a solid state camera mounted to a gyro gimbal system.
MAJS: /*AERIAL RECONNAISSANCE/*AIRBORNE EQUIPMENT/*NAVIGATION AIDS/*REMOTELY PILOTED VEHICLES/*SURVEILLANCE

80A29663
UTTL: The design and manufacture of a prototype cost-effective R.P.V. engine
AUTH: A/ALLEN, P. B.
In: Remotely piloted vehicles: International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 18.1.
ABS: A prototype lightweight (about 7 lb), high performance, economical 70 cc RPV engine useful for harassment drones is described. This engine features rear disk valve induction and Schnuerle porting, uses glow ignition to give more power by using methanol for fuel, and has an opposed twin cylinder layout with minimum cylinder stagger and an ultrashort stroke configuration; fuel consumption is 1.25 lb per HP per hour.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*PROTOTYPES/*REMOTELY PILOTED VEHICLES

80A29662
UTTL: Power units for mini RPV's
AUTH: A/SHORT, D. P.
In: Remotely piloted vehicles: International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 16.1-16.7.
ABS: Production engines suitable for mini-remotely piloted vehicles (RPVs), having minimum bulk and weight for a given power output are discussed, including engines designed for chain saws, snowmobiles, and go-carts. Attention is given to the carburetor, exhaust and fuel systems, and the alternator. Typical specifications for such future mini-RPV engines include: rated output at 6500-8000 rpm, BMEP at rating 75-80 psi, specific fuel consumption at cruise condition better than 0.75 lb/bhp hr, and specific weight of a running engine, not including exhaust system, better than 1 lb/bhp.
MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*REMOTELY PILOTED VEHICLES

80A29661
UTTL: Development, flight test and application of RPV control law concepts for microprocessor based computers
AUTH: A/WOOLLEY, M.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 14.1-14.18.
ABS: The control laws developed for use in a relatively small, slow digital computer, that is, the microprocessor flight control system, are described and subsequent flight testing is discussed. Analysis of the digital system and the techniques used are described; these include small perturbation z-transform analyses and extensive six-degree-of-freedom simulation modelling. Attention is also given to the application of the control law concepts to future vehicles such as the NASA highly maneuverable aircraft technology (HiMAT) vehicle, which was designed to investigate high-G maneuvering capability, and the Navy FIREBRAND, a multimission, multiuse supersonic aerial target.
MAJS: /*AIRCRAFT CONTROL/*AIRCRAFT MANEUVERS/* MICROPROCESSORS/*REMOTELY PILOTED VEHICLES

80A29660
UTTL: Mini-RPV research
AUTH: A/COLEMAN, R.; B/ROBINS, A. J.; C/FRARY, D. J.; D/STEPHENSON, R.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 13.1-13.12.
ABS: The identification of aerodynamic derivatives (ADs) of a mini-remotely piloted research vehicle is considered, for which the extended Kalman filter algorithm (Jazwinski, 1970) is used for the extraction of airframe ADs from flight trials data. A 3-D simulation has been employed, and results indicate that the ADs in the pitch and roll planes can be identified using rate sensor measurements only, and that the yaw derivatives can be determined, provided lateral acceleration is measured.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRCRAFT CONTROL/* REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT

80A29659
UTTL: Aerofoils down to critical Reynolds numbers and the performance of remotely controlled gliders
AUTH: A/PATRICK, T. J.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 12.1-12.6.
ABS: The remote piloting of small aircraft is discussed in terms of the decline of the lift/drag ratio with decreasing Reynolds numbers due to skin friction and separation. The critical behavior and supercritical improvement of profile drag coefficient are discussed, considering such wind tunnel results as the low-speed behavior of the Eppler (1965) 387 profile. It is found that there is a reduction of the lift/drag ratio available from aerofoils at low Re due to low-incidence separation, causing a severe loss of C(L)max with a large increase of form drag. In addition, the more intense shear of laminar boundary layers at relatively short distances from the aerofoil's leading edge means that skin friction drag coefficients are higher if Re is lower.
MAJS: /*AERODYNAMIC CHARACTERISTICS/*AIRFOIL PROFILES/* GLIDERS/*REMOTELY PILOTED VEHICLES/ REYNOLDS NUMBER

80A29658
UTTL: RPV recovery systems
AUTH: A/ROBERTS, A. C.; B/LYE, J. D.; C/WHEELER, T. G.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 10.1-10.16.
ABS: Recovery methods applicable for remotely pilotec vehicles weighing between 100 and 400 lb with approach speeds of from about 50 to 100 kts are reviewed, including conventional landing (with and without arresting systems), parachutes (gliding and non-gliding types), net recovery (fixed and traveling nets), and wire engagement systems. In addition, inclined landing ramps, retrorockets and large pneumatic recovery cushions are considered. Attention is given to the necessary energy absorption devices, both the ground mounted systems such as drag chains and soft ground or gravel, and the airborne impact attenuation systems such as airbags, crushable structures, and parachute reel-in. It is concluded that the most economical methods are non-gliding parachutes and conventional landing, while net and arrester wire systems are effective but more expensive.
MAJS: /*AIRCRAFT LANDING/*RECOVERY/*REMOTELY PILOTED VEHICLES/*SYSTEMS ENGINEERING

80A29657
UTTL: Parachute recovery systems. I - Parachute materials, applications and design. II - The recovery system as an integral part of vehicle design
AUTH: A/WHITE, B. W.; B/NORTHEY, D.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 9.1-9.15.
ABS: Parachute recovery systems are discussed in terms of materials such as silk, spun bonded nylon, polyolefin, dacron, and woven nylon, and designs including conical, ribbon, shaped, flat and cruciform parachutes, the ring slot, and the ring sail. Attention is given to parachute deployment and inflation, taking into account the payload, the terminal velocity, and whether the parachute is for personnel or weapon retardation. Integration of the parachute with the system is also discussed, and a comparison between a single parachute and a cluster is presented on the basis of performance, including system stability and the airspace needed to achieve terminal velocity.
MAJS: /*RECOVERY PARACHUTES/*REMOTELY PILOTED VEHICLES/* SYSTEMS ENGINEERING

80A29656
UTTL: A low budget experimental RPV system
AUTH: A/SVERNBY, A. W.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 8.1-8.16.
ABS: An experimental remotely piloted vehicle system under consideration in Sweden is discussed, which uses a target drone and as much off-the-shelf avionics as possible. Attention is given to solid rocket booster launch, recovery via two stage parachute system, digital guidance and control, inertial navigation utilizing strapdown technology, and a terrain following system using a laser. Also considered are the engine, command and video links, the ground control station, and the testing program, including the loss factor.
MAJS: /*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES/* SYSTEMS ENGINEERING

80A29655
UTTL: VFW-Fokker-Concept for a ground-attack-RPV
AUTH: A/SCHLENKRICH, V.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 7.1-7.13.
ABS: System requirements for ground attack, remotely piloted vehicles (RPVs) for operation in the central European area are discussed; RPVs have advantages for high-threat environment use and in terms of cost effectiveness. The data link, guidance, target acquisition and weapon release aspects of RPVs are considered for three cases: stationary or quasi-stationary targets, self-radiating targets with restricted movements, and mobile point targets involving human decision making. In addition, details of the design, navigation system, target acquisition sensor system and armament for a particular recoverable RPV are presented.
MAJS: /*AIRCRAFT DESIGN/*ATTACK AIRCRAFT/*FOKKER AIRCRAFT/* REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION

80A29654
UTTL: Unmanned aircraft systems research in the UK
AUTH: A/BENJAMIN, J.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 5.1-5.3.
ABS: Objectives, testing, and research on cost-effective unmanned aircraft (UMA) in the UK are reviewed. The design characteristics of tested UMA are given, including mass, dimensions, speed, range, and payload capabilities (2-15 kg), and vehicle instrumentation to enable autonomous or remote pilot control as well as telemetry of the onboard systems is considered. Areas of research are also discussed, including navigation, communications, airframe and engine improvements, and propulsion requirements.
MAJS: /*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/* RESEARCH PROJECTS

80A29653
UTTL: Prospects for advanced tactical RPV's
AUTH: A/SEIDEL, F.
In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 2.1-2.8.
ABS: The concept, design, and operation of advanced tactical remotely piloted vehicles (AT-RPVs) which

attack fixed or transient targets at known locations particularly in high threat missions, and could also perform tactical air reconnaissance and electronic warfare, are discussed. AT-RPVs are to fly at low altitude with high subsonic velocity, the entire mission including weapon delivery being executed in a preprogrammed mode. Navigation by an autonomous dead-reckoning system insensitive to enemy electronic countermeasures, an update system, and filter/calibration processing, is also considered, as are cost and operational effectiveness.

MAJS: /*MILITARY AIRCRAFT/*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

80A29652

UTTL: Operations of unmanned aircraft

AUTH: A/SIMPSON, W. D.

In: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers. (A80-29651 11-01) Bristol, England, University of Bristol, 1979, p. 1.1-1.7.

ABS: Air, sea, and ground launched variants of unmanned aircraft for military uses, such as reconnaissance, target identification, electronic countermeasures, weapon delivery, and antisubmarine warfare, are discussed. Attention is given to jet powered and piston engined vehicles, and to recoverable and expendable types, including cruise missiles and harassment drones. Suitable modifications or redesign for air and sea carriers of unmanned aircraft are discussed, and it is proposed that special carrier systems, including ships, light fixed wing aircraft, and airships should be designed.

MAJS: /*MILITARY AIRCRAFT/*MILITARY OPERATIONS/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

80A29651

UTTL: Remotely piloted vehicles; International Conference, Bristol, England, September 3-5, 1979, Conference Papers and Supplementary Papers

Conference sponsored by the Royal Aeronautical Society and University of Bristol, Bristol, England, University of Bristol, 1979, Conference Papers, 190 p.; Supplementary Papers, 84 p. (For individual items see A80-29652 to A80-29674)

ABS: Remotely piloted vehicles (RPVs), which are useful for military purposes in high-threat environments and for civilian purposes because of cost effectiveness, are surveyed. Various RPV systems and operations are discussed in terms of design and testing, such as airframes, control systems, engines, navigation, communications and recovery systems. RPVs ranging from harassment drones to mini-RPVs are considered as are payloads for surveillance, agricultural use and weapons delivery.

MAJS: /*AIRCRAFT DESIGN/*CONFERENCES/*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES

80A27236

UTTL: Firebrand anti-ship missile target - Flight test program objectives and vehicle instrumentation requirements

AUTH: A/LEHMAN, L. O.

In: Society of Flight Test Engineers, Annual Symposium, 10th, Las Vegas, Nev., September 4-6, 1979, Proceedings. (A80-27226 10-05) Lancaster, Calif., Society of Flight Test Engineers, 1979, 19 p.

ABS: The paper examines the Firebrand supersonic anti-ship missile target system which will provide realistic threat simulation for test and evaluation of ship defense weapons systems. The flight test plans including the vehicle configuration requirements and objectives for the evaluation phase of the Contractor Test and Evaluation and Navy Technical Evaluation are discussed; demonstration flights which will collect mission profile data and reliability data are described. Instrumentation requirements for each vehicle configuration are defined, and a summary of the planned flight test schedules is presented.

MAJS: /*AVIONICS/*FLIGHT TEST INSTRUMENTS/*MISSILE COMPONENTS/*MISSILE CONFIGURATIONS/*REMOTELY PILOTED VEHICLES/*TARGET SIMULATORS

80A26820

UTTL: Airborne spacecraft - A remotely powered, high-altitude RPV for environmental applications

AUTH: A/YOUNGBLOOD, J. W.; B/DARNELL, W. L.; C/JOHNSON, R. W.; D/HARRISS, R. C. CORP: National Aeronautics and Space Administration, Langley Research Center, Langley Station, Va.

Institute of Electrical and Electronics Engineers, Electronics and Aerospace Systems Conference, Arlington, Va., Oct. 9-11, 1979, Paper, 7 p.

ABS: A high-altitude, unmanned, propeller-driven electric airplane is proposed for remote sensing of environmental phenomena. With motive power from surface-mounted solar arrays or microwave receivers, flight endurance of weeks to months could be anticipated. The proposed system offers unique capability for monitoring oceanic and atmospheric characteristics on local or regional scales. Coastal marine and tropospheric research activities, which require temporal resolutions of 2-72 hours, would be prime application areas. Potential missions might

include the monitoring of ocean disposals, episodic marine biological events, and river/ocean interactions. Preliminary sizing and performance calculations are presented along with possible mission scenarios and payload complements.

MAJS: /*AERIAL RECONNAISSANCE/*AIRCRAFT DESIGN/*ELECTRIC MOTORS/*MICROWAVE TRANSMISSION/*REMOTELY PILOTED VEHICLES/*SOLAR ENERGY CONVERSION

80A25981

UTTL: Techniques of DPCM picture coding for RPV TV

AUTH: A/LIPPMANN, R.

In: ICC '79; International Conference on Communications, Boston, Mass., June 10-14, 1979, Conference Record, Volume 3. (A80-25901 09 32) Piscataway, N.J., Institute of Electrical and Electronics Engineers, Inc., 1979, p. 52.4.1-52.4.5.

ABS: Methods for obtaining low bit rates of digitally encoded video signals are discussed. These methods are relevant especially in increasing the efficiency of noise-resistant video links for remotely piloted vehicles (RPVs). The techniques described provide rates of 1, 1.5 and 2 bits per picture element (pel), and are based on differential PCM (DPCM) with fixed-length words. In the 1.5-bit mode every two adjacent pels are block-coded with 3 bits. The suitable two-dimensional prediction uses four pels. Three-dimensional prediction or temporal post filtering leads to further improvements in picture quality, with respect to reduced effects of quantizing and channel errors. The efficiency can be increased by coding the central (or target) area with a higher accuracy than the rest of the picture. Performance results are presented in terms of still pictures and video scenes. The DPCM techniques are compared with transform coding, operating under the same conditions.

MAJS: /*CODING/*DIGITAL TELEVISION/*PULSE CODE MODULATION/*REMOTELY PILOTED VEHICLES

80A23462

UTTL: Pyrotechnic delay cutters for more severe acceleration and temperature environments

AUTH: A/BROOKS, D. H.; B/VALENTA, F. J.

In: Symposium on Explosives and Pyrotechnics, 10th, San Francisco, Calif., February 14-16, 1979, Proceedings. (A80-23459 08-28) Philadelphia, Pa., Franklin Research Center, 1979, p. 12-1 to 12-13.

ABS: The U.S. Air Force has experienced failures with in-service reefing line pyrotechnic delay cutters employed in Mid-Air Retrieval Systems (MARS) for remotely piloted vehicle (RPV) recovery. The failures have been attributed to environmental conditions during MARS deployment. The Naval Ordnance Station, Indian Head MD (NAVORDSTA) is currently completing the development of two pyrotechnic delay cutters providing a total of nine different time delays. The cutters are required to operate under sustained high acceleration loading and to a cold temperature extreme of -100 F. Other design features to optimize cutting capability and minimize mechanical pull force initiation levels have also been incorporated.

MAJS: /*AMBIENT TEMPERATURE/*PARACHUTE DESCENT/*PILOTLESS AIRCRAFT/*PYROTECHNICS/*REMOTELY PILOTED VEHICLES

80A17401

UTTL: Advanced bandwidth compression schemes

AUTH: A/SINCER, G. D.

In: Smart sensors; Proceedings of the Seminar, Washington, D.C., April 17, 18, 1979, (A80-17390 05-35) Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1979, p. 162-166.

ABS: Bandwidth compression schemes have found useful application in preventing the jamming of transmitted information. Such data reduction methods are particularly needed in the case of RPV imagery transmission. The Night Vision and Electro-Optics Laboratory has initiated funding of separate studies to access the feasibility of obtaining 100 to 1 and 10,000 to 1 compression ratios. The achievement of such ratios necessitates a considerable degree of local intelligence in which specially selected scene information only, is transmitted. The 100 to 1 concept involves sending with fidelity, just such information that is deemed to be of probable value to the RPV mission. In the case of 10,000 to 1 ratio the image is segmented, classified and only coordinates and image descriptors are transmitted.

MAJS: /*BANDWIDTH/*DATA COMPRESSION/*IMAGE PROCESSING/*NOISE REDUCTION/*REMOTELY PILOTED VEHICLES/*VIDEO COMMUNICATION

80A11175

UTTL: Take-off and landing problems of ship based RPVs

AUTH: A/NATTER, M.

In: Military Electronics Defence Expo '78; Proceedings of the Conference, Wiesbaden, West Germany, October 3-5, 1978. (A80-11151 01-04) Geneva, Interavia, S.A., 1979, p. 455-472.

ABS: The paper deals with some aspects of takeoff and landing of VTOL remotely piloted vehicles (RPVs) on ship decks. Experience obtained with Dornier's Aerodyne concept of combining VTOL properties with high-speed flight is discussed. Some results of evaluation studies are noted.

MAJS: /*AIRCRAFT LANDING/*OPERATIONAL PROBLEMS/*REMOTELY PILOTED VEHICLES/*TAKEOFF RUNS

80A11174
UTTL: Technical concept for a strike-RPV flight guidance and weapon delivery system
AUTH: A/KRIECHBAUM, G.
In: Military Electronics Defence Expo '78; Proceedings of the Conference, Wiesbaden, West Germany, October 3-5, 1978. (A80-11151 01-04) Geneva, Interavia, S.A., 1979. p. 435-454.
ABS: Tactical strike RPVs are intended to complement (rather than replace) other weapons systems in such missions where target detection and identification by the pilot are not required. In the present paper, some experience obtained in the design and development of strike RPVs during the past seven years is reviewed, along with the respective flight guidance and weapon delivery systems.
MAJS: /*FLIGHT CONTROL/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*WEAPONS DELIVERY

79A53445
UTTL: About the feasibility of a remotely piloted vehicle /RPV/ as a means of Mars exploration with an emphasis on flight mechanics
AUTH: A/MEUNTEUFEL, H. W.
International Astronautical Federation, International Astronautical Congress, 30th, Munich, West Germany, Sept. 17-22, 1979. 15 p.
ABS: Exploration of Mars by vehicles in Martian atmosphere is considered by a small remotely piloted vehicle launched by the European launcher Ariane. The Martian surface to be explored by the projected Mars Reconnaissance Aircraft (MRA), its design requirements related to environmental factors, and the proposed design to provide a minimum induced drag are discussed. The proposed propulsion systems using electric motors or piston engines propelled by hydrazine monopropellant fuel are described, showing their range vs. payload. The mission profile is compared to NASA Mini-Sniffer and the JPL Mars Flyer, noting that the MRA-100 is superior in range to Mini-Sniffer. It is concluded that Mars reconnaissance aircraft is feasible from flight mechanics standpoint, but transport to Mars remains a problem.
MAJS: /*FLIGHT MECHANICS/*MARS (PLANET)/*MISSION PLANNING/*PERFORMANCE PREDICTION/*REMOTELY PILOTED VEHICLES

79A48615
UTTL: Advanced RPV electrical systems
AUTH: A/MILLER, F. L.
In: NAECON 1979; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 15-17, 1979. Volume 1. (A79-48590 21-01) New York, Institute of Electrical and Electronics Engineers, Inc., 1979. p. 246-253.
ABS: The paper surveys the possible improvements that can be made in the electrical power systems (EPS) of remotely piloted vehicles (RPV). It is noted that off the shelf hardware, which is commonly used due to cost considerations, is becoming inadequate for the tasks and is causing operational difficulties. Attention is given to the EPS design philosophy and some specific problems such as the lack of adequate generated power, interconnection difficulties, reliability and maintainability problems such as those associated with batteries and high life cycle costs. Several types of RPVs are described such as the HALE RPV, the mini RPV, and the TEDS. Technological improvements considered include: rare earth permanent magnets, flat wire and printed circuit cable, and fiber optics.
MAJS: /*ELECTRIC POWER SUPPLIES/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

79A48608
UTTL: Microprocessor-based digital autopilot development for the XBQM-106 Mini-RPV
AUTH: A/KOGER, O. D.; B/TIETZ, D. E.; C/LAMONT, G. B.
In: NAECON 1979; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 15-17, 1979. Volume 1. (A79-48590 21-01) New York, Institute of Electrical and Electronics Engineers, Inc., 1979. p. 157-167.
ABS: Contemporary integrated circuit technology permits the employment of microprocessors in the design of small remotely piloted vehicles. The development of a microprocessor based autopilot for the XBQM-106 Mini-Remotely Piloted Vehicles (RPV) is described in this paper. With ultra-low component cost as a primary goal, the autopilot design uses the RCA CDP-1802 microprocessor. The digital autopilot was developed through the breadboard state with performance testing accomplished via hybrid simulation. Aircraft transfer functions were first derived from aerodynamic wind tunnel data. Then a complete control analysis was made of the existing analog autopilot, sensors, actuators, and aircraft dynamics. This was followed by synthesis of the digital control algorithms from the digitization of the analog control laws. Hardware was selected based on system requirements, and software to execute the digital algorithms was developed. The

results of testing by hybrid simulation indicates that the performance of the digital autopilot is very comparable to the existing analog autopilot. Sources of minor discrepancies are discussed.

MAJS: /*AIRCRAFT DESIGN/*AUTOMATIC PILOTS/*COMPUTERIZED DESIGN/*DIGITAL NAVIGATION/*MICROPROCESSORS/*REMOTELY PILOTED VEHICLES

79A47881

UTTL: Compass Cope airframe design history

AUTH: A/BROWN, R. B.
American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Meeting, New York, N.Y., Aug. 20-22, 1979, 10 p.

ABS: Preliminary design decisions on the project phase (1971-1973) and flight tests (1973-1974) of the Compass Cope remotely piloted vehicle are discussed. Mission-related decisions are presented along with engine and power plant, wing, landing gear, body, empennage, and flight control design decisions. Wind-tunnel and flight-test results are discussed. It is noted that the podded single-engine airplane arrangement utilized can be considered as a potential standard for future single-engine high-altitude surveillance designs, manned or unmanned. The airframe design features discussed also include a composite and bonded primary structure with maximum use of honeycomb and fiberglass as well as integral wing fuel containment within a honeycomb basic structure.

MAJS: /*AIRCRAFT DESIGN/*PRODUCT DEVELOPMENT/*RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES

79A47878

UTTL: Flight control systems development of highly maneuverable aircraft technology /HiMAT/ vehicle

AUTH: A/PETERSEN, K. L. CORP: National Aeronautics and Space Administration, Flight Research Center, Edwards, Calif.
American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Meeting, New York, N.Y., Aug. 20-22, 1979, 20 p.

ABS: The highly maneuverable aircraft technology (HiMAT) program was conceived to demonstrate advanced technology concepts through scaled-aircraft flight tests using a remotely piloted technique. Closed-loop primary flight control is performed from a ground-based cockpit, utilizing a digital computer and up/down telemetry links. A backup flight control system for emergency operation resides in an onboard computer. The onboard systems are designed to provide fail-operational capabilities and utilize two microcomputers, dual uplink receiver/decoders, and redundant hydraulic actuation and power systems. This paper discusses the design and validation of the primary and backup digital flight control systems as well as the unique pilot and specialized systems interfaces.

MAJS: /*DIGITAL COMMAND SYSTEMS/*GROUND BASED CONTROL/*REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT

79A45387

UTTL: Minimum expected cost control of linear systems with uncertain parameters - Application to remotely piloted vehicle flight control systems

AUTH: A/VINKLER, A.; B/LY, U.-L.; C/CANNON, R. H., JR.; D/WOOD, L. J.
In: Guidance and Control Conference, Boulder, Colo., August 6-8, 1979, Collection of Technical Papers. (A79-45351 19-12) New York, American Institute of Aeronautics and Astronautics, Inc., 1979, p. 379-387. Research supported by Teledyne Ryan Aeronautical.

ABS: An efficient technique for designing constant gain feedback controllers for linear systems having uncertain or variable parameters is presented and demonstrated for a realistic RPV design. This controller design technique - named Minimum Expected Cost Control - produces closed-loop syster behavior which is acceptable for all values of the parameters within specified limits and is optimum in some overall sense. The technique is used to design a constant gain lateral auto-pilot for an RPV that will fly at a wide range of altitudes and airspeeds. Both full and partial state feedback situations are considered. Extension of the method to the design of dynamic feedback compensators is shown to be straightforward.

MAJS: /*AUTOMATIC PILOTS/*COST ESTIMATES/*FEEDBACK CONTROL/*FLIGHT CONTROL/*REMOTELY PILOTED VEHICLES

79A42401

UTTL: Unmanned mini-blimp system

AUTH: A/SEEMANN, G. R.; B/BROWN, G. J.; C/HARRIS, G. L.
In: Lighter-Than-Air Systems Technology Conference, Palo Alto, Calif., July 11-13, 1979, Technical Papers. (A79-42378 18-01) New York, American Institute of Aeronautics and Astronautics, Inc., 1979, p. 181-186.

ABS: Technology development of an unmanned (remotely piloted) mini-blimp (RPMB) during the past four years are discussed including aerodynamics, propulsion, flight control, envelope and car construction. Flight test results of two prototype systems are presented. Applications are numerous for both civil and military. This paper deals primarily with civil applications such as law enforcement, customs and immigration, pollution monitoring, and surveillance and patrol. A

law-enforcement RPMB system is presented in detail including technical and operational data. Funding is required for a full scale demonstration in a civilian application before implementation in an urban area.

MAJS: /*AERIAL RECONNAISSANCE/*AIRSHIPS/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

79A36084

UTTL: Drone formation control system /DFCS/ - A new generation test range system

AUTH: A/RICE, W. A.; B/REHM, K. D.

In: PLANS 1978; Position Location and Navigation Symposium, San Diego, Calif., November 6-9, 1978, Record. (A79-36063 15-04) New York, Institute of Electrical and Electronics Engineers, Inc., 1978, p. 182-190.

ABS: The Drone Formation Control System (DFCS) has been operating at the White Sands Missile range since September 1976. This paper briefly describes the DFCS and some of the missions performed by it. A brief description of system hardware emphasizes the data link and display subsystems. The DFCS uses distance-measuring equipment to locate a drone; then, the DFCS compares the present drone position to that desired and generates the commands necessary to bring the drone to the desired location. The paper highlights the various types of missions the DFCS can support and discusses missions that used BQM-34s and POM-102s in single and multiple aircraft formations at all altitudes. Included are manual and automatic control, high 'g' maneuvers, and the takeoff and landing of GF102 and GF86 drones. The effects of multipath on DFCS data link performance over land and water are also presented

MAJS: /*AUTOMATIC FLIGHT CONTROL/*DRONE AIRCRAFT/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*SYSTEMS ANALYSIS/*TEST RANGES

79A31236

UTTL: Tactical pilotless aircraft - Do they really have a future

AUTH: A/BULLOCH, C.

Interavia, vol. 34, Apr. 1979, p. 335-338.

ABS: Configuration and tactical roles of pilotless aircraft are discussed, together with a review of a Navy program projected to devise a vehicle launchable in a tail-sitting attitude from vessels not otherwise equipped to handle aircraft. There are three basic types of pilotless aircraft: (1) drones, needing no human intervention after launching, (2) remotely piloted vehicles (RPVs), tracked and controlled by an operator located near the forward edge of the battle area, and (3) hybrid systems, utilizing a planned mission program together with remote pilotage for the launch and recovery phases. The classic configuration for drones and RPVs has been a small aircraft, or missile shaped body, powered by a turbojet engine with 57-77C kg thrust. The vehicles are generally launched by a solid rocket booster technique, and recovered by parachute. Of the various military applications of the pilotless aircraft, battlefield surveillance, saturation, and harassment are the most important.

MAJS: /*AIRCRAFT DESIGN/*MILITARY AIRCRAFT/*PILOTLESS AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGICAL FORECASTING

79A26627

UTTL: Foam Impact Attenuation System

AUTH: A/MEHAFFIE, S. R.

In: Aerodynamic Decelerator and Balloon Technology Conference, 6th, Houston, Tex., March 5-7, 1979, Technical Papers. (A79-26626 10-01) New York, American Institute of Aeronautics and Astronautics, Inc., 1979, p. 1-10.

ABS: A ground impact attenuation system for aerospace vehicles based on foamed-in-place polyurethane foam has been developed. The concept was reduced to practice and developed to the prototype stage during a three year, in-house, Air Force investigation beginning in 1975. A series of 91 full scale tests of the FIAS (Foam Impact Attenuation System) against the requirements of the AQM-34V remotely piloted vehicle demonstrated the systems's performance with a 60-sec operating time. Subsequent work has produced a foam dispensing system capable of achieving a FIAS deployment time of 5 sec. Spinoffs from this program have created new concepts in deployable composite structures.

MAJS: /*AIRCRAFT LANDING/*IMPACT LOADS/*POLYURETHANE FOAM/*REMOTELY PILOTED VEHICLES/*SHOCK ABSORBERS

79A19898

UTTL: Air attack RPVs

AUTH: A/SPINTZYK, J.; B/STARKE, P.

Dornier Post (English Edition), no. 3, 1978, p. 37-40.

ABS: The air attack RPV weapons system is expected to fulfill the task of combatting highly defended fixed and movable targets, especially at the beginning of a conflict. Studies have shown that the recoverable vehicle is more cost-effective than a nonrecoverable, expendable RPV at loss rates of between approximately 3 and 50%. At loss rates above 50%, which can be expected at greater penetration depths, the expendable RPV becomes more cost-effective. Since the air attack

RPV is less costly than an aircraft, for a given budget the mixed fleet of aircraft and air attack RPVs is essentially larger than a fleet of all aircraft. For an unmanned combat aircraft equipped with a hybrid navigation system, consisting of a strapdown measuring system and an analog matched filter with suitable support system, a CEP value of less than 50 m is expected, independent of the range.

MAJS: /*ATTACK AIRCRAFT/*DRONE AIRCRAFT/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

79A18198

UTTL: Applied problems of the optimal dynamic control theory of unmanned flight vehicles

AUTH: A/DMITRIEVSKII, A. A.; B/LYSENKO, L. N.

Moscow, Izdatel'stvo Mashinostroenie, 1978. 328 p. In Russian.

ABS: The book deals with methods that can be used to solve applied problems of optimizing the motion of rockets and missiles within the framework of a modern theory of control in the space of states. Attention is given to optimal control models, including determinate, stochastic, and game-theoretic models, and to the mathematical formalization of dynamic processes and synthesis of optimal control systems. The control plants considered are described by linear and nonlinear ordinary differential equations, by finite-difference equations with variable coefficients, and by stochastic differential equations. The potentialities of the theory and means of applying it are demonstrated by examples.

MAJS: /*AUTOMATIC FLIGHT CONTROL/*CONTROL THEORY/*MISSILE CONTROL/*OPTIMAL CONTROL/*REMOTELY PILOTED VEHICLES

79A18136

UTTL: High-performance VTOL for over-the-horizon targeting

AUTH: A/SCHWOERER, R. F.

In: American Helicopter Society, Annual National Forum, 34th, Washington, D.C., May 15-17, 1978, Proceedings. (A79-18126 05-01) Washington, D.C., American Helicopter Society, 1978, 11 p.

ABS: This paper presents an evaluation of manned and remotely piloted high-performance VTOL designed to operate from small surface combatants and provide over-the-horizon (OTH) targeting for surface-to-surface cruise missiles. Three system concepts are considered: a manned aircraft operating alone, a manned aircraft operating in conjunction with a remotely piloted vehicle (RPV), and two RPVs operating together. Representative mission loads are established for each vehicle. Mission requirements, in terms of radius and time-on-station, are derived according to the size and range of the target's uncertainty area. Vehicle takeoff gross weights (TOGW) compatible with operations from small combatants and system life-cycle costs (LCC) are determined to satisfy the mission requirements. The three OTH targeting system concepts are compared on the basis of LCC for equal effectiveness and the advantages and disadvantages of each are summarized.

MAJS: /*AIRCRAFT DESIGN/*MILITARY OPERATIONS/*MISSILE CONTROL/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION /*VERTICAL TAKEOFF AIRCRAFT

79A14859

UTTL: Unmanned flight vehicle design parameter selection

AUTH: A/ZARIPOV, N. G.; B/SIRAZETDINOV, T. K.

(Aviatsionnaia Tekhnika, vol. 20, no. 4, 1977, p. 46-52.) Soviet Aeronautics, vol. 20, no. 4, 1977, p. 32-36. Translation.

ABS: (For abstract see issue 12, p. 2098, Accession no. A78-32258)

MAJS: /*AIRCRAFT DESIGN/*COMPUTERIZED DESIGN/*CONTROL CONFIGURED VEHICLES/*FLIGHT OPTIMIZATION/*REMOTELY PILOTED VEHICLES

79A14613

UTTL: A miniature air sonar altimeter

AUTH: A/ROSS, C. W.

In: Ultrasonics International 1977: Proceedings of the Conference, Brighton, England, June 28-30, 1977. (A79-14601 03-35) Guildford, Surrey, England, IPC Science and Technology Press, Ltd., 1977, p. 448-455.

ABS: An air sonar echo ranging device was developed in prototype form to demonstrate the effectiveness of a single-transducer system, requiring little adjustment for optimum performance. The device is intended primarily as an altimeter for use on miniature remotely piloted aircraft for terrain following applications. This paper describes the single-transducer system design and the associated electronics. Particular attention is given to limitations of near range in the transducer system due to the inherent high Q of the transducer and reverberation in the back mass.

MAJS: /*ALTIMETERS/*MINIATURE ELECTRONIC EQUIPMENT/*REMOTELY PILOTED VEHICLES/*SONAR/*SOUND DETECTING AND RANGING/* TERRAIN FOLLOWING AIRCRAFT

79A14053
UTTL: Weapons delivery of conventional air-ground weaponry
AUTH: A/KLEMM, W. B.; B/SCHLENKRICH, V.
Deutsche Gesellschaft fuer Luft- und Raumfahrt and Hermann-Oberth-Gesellschaft, Deutscher Luft- und Raumfahrtkongress, Darmstadt, West Germany, Sept. 19-23, 1978, DGLR 25 p. In German.
ABS: Simulations of the release of conventional air-ground weapons from low-flying RPVs in high-speed low-level flight were carried out in order to study the effect of individual release errors on the target errors. The release errors, obtained from the dynamic behavior of the carrier in the aiming flight phase, were also simulated. The results enable to formulate additional requirements on the weapons guidance computer. More time between the end of the conversion maneuver and weapons release is shown to be desirable.
MAJS: /*BOMBS (ORDNANCE)/*FLIGHT SIMULATION/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

79A13226
UTTL: Communications management by the remote system - An adaptive approach
AUTH: A/STEEB, R.; B/PURCELL, D.
In: Human Factors Society, Annual Meeting, 21st, San Francisco, Calif., October 17-20, 1977, Proceedings. (A79-13181 03-54) Santa Monica, Calif., Human Factors Society, Inc., 1977, p. 495-500.
ABS: A variety of factors have to be considered in connection with the efficient management of communications between a remote system and a supervisory human operator. Besides noise, channel capacity, and time considerations, there may be problems regarding energy consumption, operator attention demands, and even hazards of detection. It is proposed to optimize the communications by placing much of the responsibility for communications evaluation and management with the remote element. Evaluation and management of communications by an onboard computer has a number of advantages over human supervision of communications. An approach for implementing such a system is discussed. Attention is given to modeling approaches, the communications decision structure, the schematic representation of an adaptive decision model, the decision aiding process, and simulation tests.
MAJS: /*ADAPTIVE CONTROL/*AUTOMATIC PILOTS/*DECISION MAKING /*INFORMATION MANAGEMENT/*MAN MACHINE SYSTEMS/* REMOTELY PILOTED VEHICLES

79A12C13
UTTL: Infrared landing system for a mini remotely-piloted vehicle
AUTH: A/PAULSON, R.; B/PRICE, E.; C/HODOR, H.; D/BARNEY, J.
In: Modern utilization of infrared technology III: Civilian and military; Proceedings of the Third Seminar, San Diego, Calif., August 25, 26, 1977. (A79-12067 02-35) Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 214-220.
ABS: An infrared automatic landing system for guiding a mini remotely piloted vehicle (RPV) into a net has been designed and conceptually tested. The system consists of a ground-based pulsed GaAs laser transmitter illuminating a cooperative RPV, and a ground-based tracking receiver sensing the position of the RPV. This position information is telemetered back through the control link to the RPV to guide it down. A key element in the system is a state-of-art tracking receiver that has no moving parts, but uses a holographic field lens to do the real-time signal processing. The receiver, besides providing position data, also gives ranging information. The complete landing system is packaged in a battery operable box critically placed on the ground at the landing area.
MAJS: /*AIRCRAFT LANDING/*AUTOMATIC LANDING CONTROL/* INFRARED TRACKING/*REMOTELY PILOTED VEHICLES

79A12C11
UTTL: A digital real time intraframe video bandwidth compression system
AUTH: A/WHITEHOUSE, H.; B/WRENCH, E.; C/WEBER, A.; D/CLAFFIE, G.; E/RICHARDS, J.; F/RUDNICK, J.; G/SCHAMING, W.; H/SCHANNE, J.
In: Applications of digital image processing; Proceedings of the International Optical Computing Conference, San Diego, Calif., August 25, 26, 1977. (A79-12003 02-35) Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 64-78. DARPA-sponsored research;
ABS: The implementation of a digital, real-time, intraframe video bandwidth compression system into hardware for the integrated communication and Navigation Systems of the Army's Aquila remotely powered vehicle is reported. The basic system concept and operation are reviewed along with the associated algorithms (cosine transform, integer implementation, coefficient standardization, and the differential pulsecode modulation encoder). The compression assembly is evaluated in terms of the nine-by-nine-bit sign magnitude multiplier, the nine-bit adder, and the dual register retimer. The direct cosine transform

processor, which serves as a pipeline processing two elements at a time, is described. The development of hybrid modules for the airborne circuitry, the building of a ground-based decoding unit, and simulator performance are outlined.

MAJS: /*DATA COMPRESSION/*DIGITAL SYSTEMS/*IMAGE PROCESSING /*REAL TIME OPERATION/*REMOTELY PILOTED VEHICLES/* TELEVISION TRANSMISSION

79A11480

UTTL: Modeling and analysis using SAINT - A combined discrete/continuous network simulation language

AUTH: A/WORTMAN, D. B.; B/DUKET, S. D.; C/SEIFERT, D. J.
In: Winter Simulation Conference, Gaithersburg, Md., December 5-7, 1977, Proceedings. Volume 2. (A79-11476 01-59) New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 528-534.

ABS: A network modeling and simulation technique, called Systems Analysis of Integrated Networks of Tasks (SAINT), has been developed to assist in the design and analysis of complex man-machine systems. SAINT allows engineers and human factors specialists to develop system models in which men, machines, and environmental conditions are represented as elements of a network. SAINT has been used to determine the feasibility of integrating human resources data and maintenance task data with a computer simulation technique to form a computer-based tool for performing safety analyses of nuclear systems. Aspects of network modeling and analysis are discussed along with SAINT modeling concepts, taking into account the discrete model component, the continuous model component, and discrete and continuous component interactions. Attention is also given to the SAINT simulation program.

MAJS: /*COMPUTERIZED SIMULATION/*MAN MACHINE SYSTEMS/* NETWORK ANALYSIS/*PROGRAMMING LANGUAGES/*REMOTELY PILOTED VEHICLES/*SYSTEMS ANALYSIS

79A10820

UTTL: 20 hp mini-RPV demonstrator engine programs

AUTH: A/JOHNSON, E. T.; B/SMITH, K. F.; C/MARSTILLER, J. K.
American Society of Mechanical Engineers, Gas Turbine Conference and Products Show, London, England, Apr. 9-13, 1978. 10 p.

ABS: This paper presents the selection, design, and initial test of two 15 kw (20-hp), two-cylinder, two-stroke demonstrator engines for use on mini-RPV aircraft. The objectives are (1) to provide a technology base for mini-RPV engines using current high-production components; (2) to identify areas where future development and procurement costs can be reduced without compromising the propulsion system's ability, and survivability of the concepts. Future development work must, therefore, be aimed at applying this technology base to a propulsion system design to meet specific mini-RPV applications.

MAJS: /*AIRCRAFT ENGINES/*ENGINE DESIGN/*ENGINE TESTS/* MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES

78A52498

UTTL: A visual simulation procedure for the processing of television images with reduced frame rates in the case of representations of outside views from remotely piloted vehicles

AUTH: A/SCHULZ-HELBACH, K. D.
Meckenheim, Forschungsinstitut fuer Anthropotechnik (Forschungsinstitut fuer Anthropotechnik, Bericht, No. 35), 1977. 42 p. In German.

ABS: The transmission of image information from a remotely piloted vehicle to the ground station is of importance for a successful mission. Particular attention must, therefore, be given to approaches which will prevent a disturbance or interruption of this communication link. A description is presented of a number of such approaches, taking into account human factor considerations. Approaches which can be used with respect to picture transmission in the case of a disturbed information channel are discussed, taking into account a reduction of the amount of information transmitted per picture and an increase in image transmission time. The properties of image sensors for reduced frame rates are examined. Attention is also given to details of image processing, which in case of an employment of the considered approaches is necessary to add missing information regarding the motion of the remotely piloted vehicle.

MAJS: /*AERIAL RECONNAISSANCE/*FLIGHT SIMULATORS/*IMAGE PROCESSING/*REMOTELY PILOTED VEHICLES/*TELEVISION RECEPTION/*VISUAL OBSERVATION

78A50184

UTTL: Guaranteed cost control of linear systems with uncertain parameters - Application to remotely piloted vehicle flight control systems

AUTH: A/VINKLER, A.; B/WOOD, L. J.
In: Guidance and Control Conference, Palo Alto, Calif., August 7-9, 1978, Technical Papers. (A78-50159 22-01) New York, American Institute of Aeronautics and Astronautics, Inc., 1978, p. 226-234. Research supported by the Teledyne Ryan Aeronautical.

ABS: In many physical systems, an accurate knowledge of certain parameters is very difficult or very expensive

to obtain. The designer of an RPV flight control system, for example, frequently has available little data regarding aerodynamic coefficients, due to a lack of wind tunnel tests. Based on the concept of guaranteed cost control, an algorithm has been developed to analyze the effect of parameter uncertainties on closed-loop system stability. An extension of this algorithm results in a technique for choosing constant feedback gains which result in stable closed-loop behavior for a range of parameter values. This technique has been applied to the design of a lateral autopilot for a rudderless RPV with uncertain aerodynamic coefficients.

MAJS: /*ALGORITHMS/*AUTOMATIC FLIGHT CONTROL/*FEEDBACK CONTROL/*LINEAR SYSTEMS/*OPTIMAL CONTROL/*REMOTELY PILOTED VEHICLES/*SYSTEMS STABILITY

78A50183

UTTL: The evolution of a remotely piloted vehicle microprocessor flight control system

AUTH: A/WOOLLEY, M.

In: Guidance and Control Conference, Palo Alto, Calif., August 7-9, 1978, Technical Papers. (A78-50159 22-01; New York, American Institute of Aeronautics and Astronautics, Inc., 1978, p. 208-225.

ABS: The development of a microprocessor flight control system (MFCS) for RPVs is traced through the evolution of the control concepts to the flight testing of the MFCS. RPV control law concepts were applied in the digital system and provided a natural division for multirate computations, significantly alleviating computational requirements. Analytical aspects of the design process, such as z-transform analyses, sample rate determination, computational constraints and simulation analyses are discussed. Data obtained from the MFCS flight tests are presented and compared with simulation results and with the test data for a current analog system.

MAJS: /*AUTOMATIC FLIGHT CONTROL/*MICROPROCESSORS/*NUMERICAL CONTROL/*REMOTELY PILOTED VEHICLES

78A50182

UTTL: Guidance and control problems in semiautomatic recovery of the Aquila RPV

AUTH: A/BEAL, T. R.

In: Guidance and Control Conference, Palo Alto, Calif., August 7-9, 1978, Technical Papers. (A78-50159 22-01) New York, American Institute of Aeronautics and Astronautics, Inc., 1978, p. 202-207.

ABS: This paper describes the recovery system for the Aquila RPV developed by Lockheed Missiles & Space Company, Inc. (LMSC), for the U.S. Army. The approach flight control concept is presented, as are the guidance command algorithms that control the flight to a fixed glide slope boresighted to a TV camera. The camera is located on the ground behind a vertical net and is adjusted to define a 4-deg glide slope leading into the net. To recover the RPV, an operator controls the motion of a cursor on a TV screen to follow the RPV image as closely as possible. The coordinates of the cursor provide the basis for the guidance command algorithms. Also, in this paper the predominant sources of error in the recovery system are identified and analyzed, computer modeling of the human operator transfer function is discussed, and the effects of sharp-edged gusts on recovery performance are presented.

MAJS: /*AIRCRAFT GUIDANCE/*APPROACH CONTROL/*NETS/*REMOTELY PILOTED VEHICLES/*TELEVISION CAMERAS

78A50181

UTTL: RPV flying qualities design criteria

AUTH: A/NEICHBOR, T. L.; B/WILER, C. D.

In: Guidance and Control Conference, Palo Alto, Calif., August 7-9, 1978, Technical Papers. (A78-50159 22-01) New York, American Institute of Aeronautics and Astronautics, Inc., 1978, p. 192-201.

ABS: In January 1976, a contract with an American aerospace company was initiated by the Air Force with the objective to establish a framework for remotely piloted vehicle (RPV) flying qualities criteria. Later phases of the program were to provide data for that framework. One of the essential aspects of RPV flying qualities criteria is that they must consider the total RPV system. This includes not only vehicle stability and control, but must also encompass automatic and manual control, command and data link, and man-machine interfaces. The general organization of the scope and classification section is considered, taking into account vehicle classes, flight phases, and the level of RPV flying qualities. The system requirements examined are related to automatic control, manual control, stability margins, operation and interface, and atmospheric disturbances.

MAJS: /*AIRCRAFT CONTROL/*AIRCRAFT DESIGN/*FLIGHT CHARACTERISTICS/*FLIGHT CONTROL/*REMOTELY PILOTED VEHICLES

78A50179

UTTL: Shipboard launch and recovery of RPV helicopters in high sea states

AUTH: A/GEVAERT, G.; B/SCHULZE, E.

In: Guidance and Control Conference, Palo Alto, Calif., August 7-9, 1978, Technical Papers. (A78-50159

22-01) New York, American Institute of Aeronautics and Astronautics, Inc., 1978, p. 175-182.

ABS: We have recently completed an analytical design of a fully automatic helicopter shipboard recovery system. Two simulated vehicles were used in the study, the Gyrodyne QH-50 drone helicopter and a Development Sciences, Inc. (DSI) rotary-wing research RPV. Guidance and control algorithms were developed to successfully land the aircraft on board a nonaviation ship in high seas. The study employed six DOF helicopter models and recorded ship motion data in both fully automatic and remote pilot-in-the loop simulations which were used to establish statistical performance. The simulation, developed system and the tradeoffs that led to the final design are described in this paper. The expected performance as a function of recovery conditions and recommended criteria for successful recovery are presented. The study indicates that safe launch and recovery in sea state 5 are possible.

MAJS: /*AUTOMATIC LANDING CONTROL/*HELICOPTER CONTROL/*MILITARY OPERATIONS/*REMOTELY PILOTED VEHICLES/*SEA LAUNCHING/*SEA STATES/*VERTICAL LANDING

78A49262

UTTL: Effectiveness of basic display augmentation in vehicular control by visual field cues

AUTH: A/GRUNWALD, A. J.; B/MERHAV, S. J. CORP: National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.; Technion - Israel Inst. of Tech., Haifa.

IEEE Transactions on Systems, Man, and Cybernetics, vol. SMC-8, Sept. 1978, p. 679-690. Research supported by the Ministry of Defence of Israel.

ABS: The paper investigates the effectiveness of different basic display augmentation concepts - fixed reticle, velocity vector, and predicted future vehicle path - for RPVs controlled by a vehicle-mounted TV camera. The task is lateral manual control of a low flying RPV along a straight reference line in the presence of random side gusts. The man-machine system and the visual interface are modeled as a linear time-invariant system. Minimization of a quadratic performance criterion is assumed to underlie the control strategy of a well-trained human operator. The solution for the optimal feedback matrix enables the explicit computation of the variances of lateral deviation and directional error of the vehicle and of the control force that are used as performance measures.

MAJS: /*DISPLAY DEVICES/*REMOTELY PILOTED VEHICLES/*VISUAL CONTROL/*VISUAL FIELDS

78A47908

UTTL: The HIMAT RPRV system

AUTH: A/BROWN, L. E., JR.; B/ROE, M. H.; C/WILER, C. D. American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Conference, Los Angeles, Calif., Aug. 21-23, 1978, 13 p.

ABS: Two remotely piloted research vehicles (RPRVs) which are 44% scale versions of an advanced highly maneuverable fighter design have been delivered to NASA for flight testing. These research airplanes will demonstrate the contribution to the future air-to-air fighter of several advanced technologies, including aeroelastic tailoring, supercritical airfoils, close-coupled canard, variable camber, and advanced composite materials. Digital fly-by-wire control technology is employed with the control laws being implemented in a ground-based computer. The HIMAT is designed with a 12-g limit load factor and can perform sustained maneuvering at 8 g at 0.9 M at 25,000-foot altitude. The HIMAT has been designed and fabricated with a modular approach which facilitates modification for testing of other structural, aerodynamic, propulsion, or flight-control concepts. The HIMAT RPRVs will be launched from a B-52 and flown through their test flight mission by a ground-based pilot. Landings will be made on a dry lake bed, utilizing skids rather than wheels on the landing gear.

MAJS: /*AIRCRAFT DESIGN/*AIRCRAFT MANEUVERS/*FIGHTER AIRCRAFT/*GROUND BASED CONTROL/*REMOTELY PILOTED VEHICLES/*RESEARCH VEHICLES

78A41877

UTTL: Aircraft operating environments around high speed ships

AUTH: A/MARCHMAN, J. F., III American Institute of Aeronautics and Astronautics, Fluid and Plasma Dynamics Conference, 11th, Seattle, Wash., July 10-12, 1978, 12 p.

ABS: A wind tunnel study was conducted to determine the flowfield around a hydrofoil ship in order to determine the operating environment for a remotely piloted vehicle in the vicinity of the ship. Flow visualization tests were conducted using smoke and wool tufts. Tests were run using an RPV model mounted on a traverse such that it could simulate aircraft reactions to the flow. Velocity profiles were examined in detail at two stations along the ship fantail. All tests were run over a range of ship yaw angles between plus or minus 15 deg. Tests were run with and without ship stack exhaust simulation. The dominant feature was shown to be two vortices along the ship's deck edge which may make aircraft operation from high speed ships difficult, if not impossible.

MAJS: /*AIRCRAFT STABILITY/*FLOW DISTRIBUTION/*HYDROFOIL CRAFT/*REMOTELY PILOTED VEHICLES/*SEA LAUNCHING/* VELOCITY DISTRIBUTION

78A40205
UTTL: Imaging sensors for RPVs
AUTH: A/SHERMAN, N.; B/STICH, K.
In: Airborne reconnaissance - Tactical/real time; Proceedings of the Seminar, Reston, Va., April 18-21, 1977. (A78-40201 17-35) Bellingham, Wash., Society of Photo-Optical Instrumentation Engineers, 1977, p. 26-37.
ABS: Mission requirements for mini RPVs are given which set the boundary conditions for electro-optical sensor operation. Sensor performance goals are postulated and from these objectives a class of sensor is identified. These include high performance thermal imaging and silicon television as well as more austere intensified solid state imagers and pyroelectric vidicons. Current development status and improvements for these devices is forecast. Finally some system design features are given for various stabilization schemes.
MAJS: /*AERIAL RECONNAISSANCE/*ELECTRO-OPTICAL PHOTOGRAPHY/* IMAGING TECHNIQUES/*REMOTE SENSORS/*REMOTELY PILOTED VEHICLES/*THERMAL MAPPING

78A38522
UTTL: Grumman's radio-controlled experimental air force
AUTH: A/FRISCH, B.
Astronautics and Aeronautics, vol. 16, June 1978, p. 40, 41.
ABS: Construction of V/STOL and forward-swept-wing experimental aircraft models is discussed. The models may provide a good indication of the static stability and control characteristics of aircraft, though they are not generally useful in studying the stall regime and the V/STOL hovering case. Spin testing through use of the foam/balsa/epoxy models is also possible.
MAJS: /*AIRCRAFT MODELS/*GRUMMAN AIRCRAFT/*RADIO CONTROL/* REMOTELY PILOTED VEHICLES/*SWEPT FORWARD WINGS/*V/STOL AIRCRAFT

78A38521
UTTL: High-flying Mini-Sniffer RPV - Mars bound
AUTH: A/REED, R. D. CORP: National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
Astronautics and Aeronautics, vol. 16, June 1978, p. 28, 29.
ABS: The Mini-Sniffer is a small unmanned survey aircraft developed by NASA to conduct turbulence and atmospheric pollution measurements from ground level to an altitude of 90,000 ft. Carrying a 25-lb air sampling apparatus, the Mini-Sniffer typically cruises for one hour at 70,000 ft before being remotely piloted back to earth. A hydrazine monopropellant engine powers the craft, while a PCM telemetering system and a radar transponder provide control functions. Development of a high-performance low-Reynolds-number airfoil could make the research craft suitable for a low-altitude terrain-following mission on Mars.
MAJS: /*MARS ATMOSPHERE/*PILOTLESS AIRCRAFT/*POLLUTION MONITORING/*RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TERRAIN FOLLOWING AIRCRAFT

78A32258
UTTL: The problem of choosing design parameters for unpiloted flight-vehicles
AUTH: A/ZARIPOV, N. G.; B/SIRAZETDINOV, T. K.
Aviatsionnaia Tekhnika, vol. 20, no. 4, 1977, p. 46-52. In Russian.
ABS: The paper considers the analytical design of a hypothetical unpiloted flight-vehicle; the problem is posed in terms of a system of ordinary differential equations with inequality constraints on the phase coordinates and controlling parameters. The controlling parameters examined are initial thrust conditions, initial load on the vehicle and the operational time of the engine.
MAJS: /*AIRCRAFT DESIGN/*COMPUTERIZED DESIGN/*CONTROL CONFIGURED VEHICLES/*FLIGHT OPTIMIZATION/*REMOTELY PILOTED VEHICLES

78A30506
UTTL: Remotely piloted aircraft in the civil environment
AUTH: A/GREGORY, T. J.; B/NELMS, W. P.; C/KARMARKAR, J. S. CORP: National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
Mechanism and Machine Theory, vol. 12, no. 5, 1977, p. 471-479.
ABS: Improved remotely piloted aircraft (RPAs), i.e., incorporating reductions in size, weight, and cost, are becoming available for civilian applications. Existing RPA programs are described and predicted into the future. Attention is given to the NASA Mini-Sniffer, which will fly to altitudes of more than 20,000 m, sample the atmosphere behind supersonic cruise aircraft, and telemeter the data to ground stations. Design and operating parameters of the aircraft are given, especially the optical sensing systems, and civilian RPA uses are outlined, including airborne research, remote mapping, rescue, message

relay, and transportation of need materials. Civil regulatory factors are also dealt with.
MAJS: /*AIRCRAFT DESIGN/*CIVIL AVIATION/*COST REDUCTION/* REMOTELY PILOTED VEHICLES/*TECHNOLOGY TRANSFER/*WEIGHT REDUCTION

78A28148
UTTL: Display augmentation in manual control of remotely piloted vehicles
AUTH: A/MERHAV, S. J.; B/GRUNWALD, A. J.
Journal of Aircraft, vol. 15, Mar. 1978, p. 182-189. Research supported by the Ministry of Defence.
ABS: The effectiveness of display aids for manual control of remotely piloted vehicles by television during landing approach is investigated. The task is lateral and vertical control along a required glide-slope trajectory in the presence of lateral and vertical random disturbances. By superimposing suitable glide-slope reference lines on the TV monitor, the glide-slope error can be derived directly from the visual field. It is theoretically investigated whether and under what conditions the display of higher-order state components is required. It is shown that for a body-mounted camera, essential angular rate information can be detected from the vertical relative motion of the visual field due to vehicle pitching. This information is particularly required for relatively slow vehicle dynamics. Rapid pitching, which occurs with fast vehicle dynamics, may be detrimental to its effective control. These disturbing motions can be easily eliminated by a gyrostabilized camera, but the essential angular and pitch information is also eliminated and control becomes difficult. A display configuration is proposed in which position, rate, and acceleration cues are derived from a single error displayed by special reference bars.
MAJS: /*AIRCRAFT CONTROL/*LANDING AIDS/*MANUAL CONTROL/* REMOTELY PILOTED VEHICLES/*TELEVISION EQUIPMENT

78A23834
UTTL: Design and analysis of propellers for low Reynolds number application to mini-RPV's
AUTH: A/BORST, H. V.
Society of Automotive Engineers, Aerospace Meeting, Los Angeles, Calif., Nov. 14-17, 1977, 27 p.
ABS: This report presents the design and analysis of propellers applied to mini-remotely piloted vehicles along with the methods used. Modifications to the airfoil data used for predicting the profile drag losses were necessary to account for operation at the low Reynolds number encountered by mini-RPV propellers. The correction was determined from the available airfoil data and low Reynolds number propeller test data. Using the revised methods of propeller analysis, optimum propellers were designed and analyzed. The study showed that improved performance can be obtained with new propeller designs.
MAJS: /*DESIGN ANALYSIS/*PROPELLERS/*REMOTELY PILOTED VEHICLES

78A23832
UTTL: Suitability of military specification lubricants for two-stroke RPV engines
AUTH: A/MAREACH, H. W., JR.; B/RUSSELL, J. A.; C/SMITH, K. F.
Society of Automotive Engineers, Aerospace Meeting, Los Angeles, Calif., Nov. 14-17, 1977, 13 p.
ABS: The Army is exploring the feasibility of using Remotely Piloted Vehicles (RPVs) in a multi-mission role. Powerplants for these RPVs are to be small, two-stroke, air-cooled, reciprocating engines which require a fuel/oil mix for operation. As no federal or military specification lubricant exists for this application, this paper details results of an analytical/experimental investigation to evaluate the suitability of existing MIL SPEC lubricant classes for Army RPV use. Performance of a limited sampling of military specification lubricants was evaluated by cyclic testing with a small two-stroke, air-cooled piston engine currently used in the Army AQUILA RPV. An ashless dispersant lubricant qualified to Boating Industry of America standards for two-cycle, water-cooled engines (BIA/TC-W) was used for reference. Standard magneto ignition and engine cooling were used in 20 of the 23 tests. The final three tests explored the combined effects of capacitive discharge ignition and elevated cylinder head temperature.
MAJS: /*EQUIPMENT SPECIFICATIONS/*LUBRICANT TESTS/* LUBRICATING OILS/*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES

78A20485
UTTL: Use of radio-controlled miniature aircraft for marine atmosphere sampling
AUTH: A/HESS, F. R.
Marine Chemistry, vol. 5, July 1977, p. 297-302
ABS: The use of Radio-Controlled Miniature aircraft by the Woods Hole Oceanographic Institution for obtaining marine air samples is discussed. The particular requirements for gaseous as well as large-volume particulate sampling are discussed and at-sea tests

performed from the R/V 'Knorr' are described. Handling and logistics of use as well as aircraft characteristics are discussed.
MAJS: /*AIR SAMPLING/*MARINE ENVIRONMENTS/*RADIO CONTROL/*REMOTELY PILOTED VEHICLES

78A17548
UTTL: A millimeter wave surveillance radar for RPVs
AUTH: A/KOSOWSKY, L. H.; B/GRAZIANO, R. S.; C/WAGNER, R.; D/DUNLAP, D.
In: Imaginative engineering thru education and experience: Proceedings of the Southeast Region 3 Conference, Williamsburg, Va., April 4-6, 1977. (A78-17526 05-31) New York, Institute of Electrical and Electronics Engineers, Inc., 1977, p. 238-243.
ABS: The development of a millimeter radar intended for use on small remotely piloted vehicles (mini-RPVs) is described. The system will operate in adverse weather and will provide multimode radar data for tactical surveillance. The radar modes include fixed target enhancement, high resolution ground map, and moving target detection. Two mission scenarios based on the radar's high resolution are examined, and several system components are described. The system is undergoing ground and airborne testing.
MAJS: /*MICROWAVE EQUIPMENT/*MILLIMETER WAVES/*RADAR RESOLUTION/*REMOTELY PILOTED VEHICLES/*SURVEILLANCE RADAR

78A16100
UTTL: Remotely piloted aircraft in the civil environment
AUTH: A/GREGORY, T. J.; B/NELMS, W. P.; C/KARMARKAR, J. S.
CORP: National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.; Systems Control, Inc., Palo Alto, Calif.
Mechanism and Machine Theory, vol. 12, 1977, p. 471-479.
ABS: Remotely piloted aircraft (RPA's) are of increasing interest to the military and others, as evidenced by a number of technology and development programs that are currently funded or planned. These programs have led to a number of test aircraft with significant capabilities, and future remotely piloted aircraft are forecast to become even more capable as the technology in a number of important subsystem areas is progressing at a rapid rate. As the size, weight and cost of RPA's is reduced, the prospect of using them for civilian applications becomes more likely.
MAJS: /*CIVIL AVIATION/*REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT/*TECHNOLOGY UTILIZATION

78A15613
UTTL: RPV video digital multiplexing system
AUTH: A/MCCLUNG, T.; B/MORISON, R.; C/GASTON, D. W.
In: NAECON '77; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 17-19, 1977. (A78-15551 04-33) New York, Institute of Electrical and Electronics Engineers, Inc., 1977. p 510-518.
ABS: Transmission of video data from RPV's to the ground control officer requires a secure, yet high fidelity medium. Further, multiple channels must be handled to simplify security measures and minimize system size and weight, both on the airborne vehicle as well as the ground station. A system which uses delta squared modulation to achieve 8:1 data compression resulting in 7 mHz bandpass is described. System timing, hardware, and actual decoded video results as they vary with system update rate and resolution of the encoding are presented.
MAJS: /*AIRCRAFT COMMUNICATION/*DIGITAL SYSTEMS/*MULTIPLEXING/*REMOTELY PILOTED VEHICLES/*VIDEO DATA

78A13450
UTTL: The AFIT remotely piloted vehicle
AUTH: A/KOLET, S. A.
AIAA Student Journal, vol. 15, Fall 1977, p. 22-26.
ABS: The Air Force Institute of Technology (AFIT) has proposed a design for a mini-remotely piloted vehicle (RPV) use[illegible] battlefield reconnaissance and studies such as tracking tests and air sampling investigations. The design has a canard configuration and twin propellers. It is controlled by a conventional off-the-shelf radio control unit. A one third scale model has been built for wind tunnel testing. Although the RPV construction was completed in 1976, it has not been flown to date as initial test flights to determine air worthiness have not been performed as yet.
MAJS: /*REMOTELY PILOTED VEHICLES/*WIND TUNNEL MODELS

78A12695
UTTL: Dual device redundancy management
AUTH: A/SMITH, L. A.; B/WILLIAMS, P. G.
In: Computers in Aerospace Conference, Los Angeles, Calif., October 31-November 2, 1977, Collection of Technical Papers. (A78-12651 02-59) New York, American Institute of Aeronautics and Astronautics, Inc., 1977, p. 338-343.
ABS: Dual control systems which can detect and isolate a faulty component are an attractive solution to automatic control systems that require a high degree of reliability with minimum cost, weight, and volume.

The analysis described in this paper is based on a RPV flight control system for which a failure would mean an air vehicle loss. Each of the flight control system's dual components is monitored as a pair and can be individually isolated from the system by the onboard automatic redundancy management function or by the ground operator. A performance exceedance monitor provides a complete swap of all online/offline components should the air vehicle exceed its performance boundaries for an unknown cause, and a minimum operational software subset is defined as the operational recovery configuration.

MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*AUTOMATIC FLIGHT CONTROL/*FAIL-SAFE SYSTEMS/*REDUNDANT COMPONENTS/* RELIABILITY ENGINEERING/*REMOTELY PILOTED VEHICLES

78A12283

UTTL: Distributed processor control of a multiple beam adaptive array for telemetry, command and control of airborne vehicles /RPV's/

AUTH: A/BUSTELO, R. A.; B/WILSON, S. S.; C/SORRENTINO, P. P.

In: Digital Avionics Systems Conference, 2nd, Los Angeles, Calif., November 2-4, 1977, Collection of Technical Papers. Conference sponsored by the American Institute of Aeronautics and Astronautics. New York, American Institute of Aeronautics and Astronautics, Inc., 1977. 5 p.

ABS: A multi-level distributed processor developed to control a multiple function phased array antenna is described. The antenna system provides multiple target tracking for command and control of RPV's, and adaptive pattern shaping for telemetry. A hierarchical architecture is defined which implements system, beam and element control using distributed microprocessors. Interprocessor communication is accomplished via a high speed shared memory. Device technology in the various microprocessors and peripheral hardware processors is matched to the computational complexity and execution speed required at each level of control. This multi-level, functionally partitioned implementation results in modular, compact, efficient hardware with better system reliability than the traditional mini-computer approach.

MAJS: /*BEAM SWITCHING/*COMMAND AND CONTROL/*DIGITAL COMMAND SYSTEMS/*PHASED ARRAYS/*RADIO TELEMETRY/*REMOTELY PILOTED VEHICLES

77A51180

UTTL: Precision location, navigation and guidance using DME techniques

AUTH: A/RANEY, J. T.; B/REHM, K. D.

In: Position Location and Navigation Symposium, San Diego, Calif., November 1-3, 1976, Proceedings. (A77-51178 24-04) New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 13-21.

ABS: A Distance Measurement Equipment (DME) approach for a precision location, navigation and control system which has multi-mission applications is presented. Specifically, a description is given of the Drone Formation Control System (DFCS) which is intended to provide simultaneous location, navigation, guidance, control and telemetry functions of up to six Remotely Piloted Vehicles (RPVs) from takeoff to landing plus precision location and navigation of four additional vehicles. Features discussed include automatic rendezvous, collision avoidance, manual/automatic control, and formation flying. The control and navigational concepts leading to accuracies of 23 feet in absolute position and 19 feet in relative position are discussed. The application of DME systems to other range instrumentation tasks, such as MSR (Mobile Sea Range), ATC (Air Traffic Control), RPV mission guidance and control, and weapon guidance applications is also considered.

MAJS: /*AIR NAVIGATION/*AIRCRAFT CONTROL/*AIRCRAFT GUIDANCE /*DISTANCE MEASURING EQUIPMENT/*POSITION (LOCATION)/* REMOTELY PILOTED VEHICLES

77A47353

UTTL: Ducted-fan VTOL RPV system

AUTH: A/JOHNSON, R. A.; B/SMALL, R. D.

In: The RPV - Complement to manned systems: Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 125-131.

ABS: A ducted-fan RPV research test vehicle which is a small, four-foot duct diameter airframe that will be capable of hover and transition to forward flight has been developed. The principle features of this airframe are its ability to take off and land vertically in confined and unprepared areas and the capacity for non-pilot trained personnel to operate the vehicle simply and safely. Ground tests were conducted on the vehicle to verify the thrust and control moments statically and to demonstrate controllability and transition characteristics on a tether rig.

MAJS: /*DUCTED FANS/*GROUND TESTS/*HOVERING/*REMOTELY PILOTED VEHICLES/*VERTICAL LANDING/*VERTICAL TAKEOFF

77A47352
UTTL: Remote rate control for RPVs
AUTH: A/HIRSCH, J.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 121-124.
ABS: The paper proposes a tactile control system which would provide the ground controller of an RPV with the sensitivity to detect the error rate of change and enable him to be alert to a fast buildup of error. Tactile signals would be used to present rate information as an alternative to 'quickening' a visual display. The video-tactile system would use two channels of information to provide a natural and instinctive method of control. The rate information could be extracted and telemetered to a control operator as tactile stimuli.
MAJS: /*DISPLAY DEVICES/*ERROR CORRECTING DEVICES/*GROUND BASED CONTROL/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*TACTILE DISCRIMINATION

77A47351
UTTL: A miniature rotary-wing RPV
AUTH: A/SUMMERS, G. D.; B/GREENE, E. G.; C/MARTIN, D. A.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 117-120.
ABS: A miniature, rotary-wing, RPV, designed and built by Atlantic Research Corporation, has been shown to be stable in flight and capable of carrying various reconnaissance payloads. The experimental aircraft has flown in several test configurations. Average all-up weight, including fuel for an hour and payload, has been approximately 26 pounds. Payloads have included a television camera and broadcast transmitter, a TV camera and a fiber-optic air-to-ground link, and a motion-picture camera. The objective of the in-house project was to demonstrate system feasibility. It is envisioned that, with further system development, this type of RPV can complement manned systems in a variety of functions, both in civil and in military applications
MAJS: /*AERIAL RECONNAISSANCE/*LIGHT AIRCRAFT/*PAYLOADS/*REMOTELY PILOTED VEHICLES/*ROTARY WING AIRCRAFT

77A47350
UTTL: Advanced avionics for the Advanced Remotely Piloted Vehicle /ARPV/
AUTH: A/PERRY, J. L.; B/GOYAL, V. K.; C/ZIESIG, D. R.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 109-116.
ABS: The Advanced Remotely Piloted Vehicle (ARPV) is a new Air Force weapons system intended to perform Reconnaissance (Recce), Electronic Warfare (EW), and Strike missions in support of manned tactical aircraft. A single multi-mission multipurpose ARPV design appears more cost-effective than a proliferation of different RPV designs, each tailored to a specific mission. The ARPV's hardware and software must be capable of rapid change, from mission to mission. To achieve this required flexibility while maintaining low life cycle cost, the Air Force Avionics Laboratory (AFAL) launched an investigation of the use of advanced multiplexing and microcomputer techniques to the ARPV. The results of this effort are presented, and include a proposed data bus architecture which is a logical extension of the Air Force's Digital Avionics Information System (DAIS).
MAJS: /*AERIAL RECONNAISSANCE/*AIRBORNE/SPACEBORNE COMPUTERS/*AVIONICS/*ELECTRONIC CONTROL/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

77A47349
UTTL: An evaluation of future RPV automatic navigation systems
AUTH: A/MC KEEL, G. J.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 102-108.
ABS: A combination of dead reckoning and position fixing systems is recommended as best suited to future navigation system requirements for remote-piloted vehicles (RPV) designed for electronic warfare, reconnaissance, or selective strike sorties. Strapdown inertial dead reckoning is given preference over the gimballed inertial variant, and position fixes can be obtained from line-of-sight, over-horizon, or correlator type (terrain contour, radiometric) systems.
MAJS: /*AERIAL RECONNAISSANCE/*ELECTRONIC CONTROL/*REMOTELY PILOTED VEHICLES/*STRAPDOWN INERTIAL GUIDANCE/*WEAPON SYSTEMS

77A47348
UTTL: Microcomputer RPV stabilization and control system
AUTH: A/ESLINGER, R. C.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 96-101.
ABS: Utilization of a microcomputer in a typical mini-midi type remote piloted vehicle (RPV) system is explored, with attention given to software development. Built-in testing procedures and automatic checkout, in addition to in-flight RPV control and stabilization, are realizable with availability of 16-bit microprocessors with high-density memories capable of functioning over the full range of military environments. Input/output signals processed by the microcomputer in the RPV system are tabulated and discussed.
MAJS: /*AIRCRAFT STABILITY/*AUTOMATIC TEST EQUIPMENT/*FLIGHT CONTROL/*LIGHT AIRCRAFT/*MICROPROCESSORS/*REMOTELY PILOTED VEHICLES

77A47347
UTTL: Development of a small, low cost turbojet engine with thrust augmentation
AUTH: A/ELROD, W. C.; B/WRIGHT, H. E.; C/WOLFE, B. L., JR.; D/CURNIAK, J. D.; E/WILKINSON, D. B.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 89-95.
ABS: Turbosuperchargers from two manufacturers were successfully converted to turbojet engines, with engine run up from idle to maximum thrust while limiting the turbine inlet temperature to 1250 K. The smaller of the two turbosupercharge systems selected for conversion (designated J-1 and J-3 engines) was the first to be converted to a turbojet engine (the J-1 unit) and subsequently the conventional combustor was replaced with a catalytic reactor (then designated the J-3 unit). The J-3 engine weighed 13.15 kg (29 lb-m) excluding the oil system and produced 133N (30 lb-f) thrust with a turbine inlet temperature of 1250 K while operating on hydrogen as a fuel. The larger turbosupercharger designated the J-2 unit operating with JP-4 as a fuel and limiting the turbine inlet temperature to 1250 K produced 330 N (74.5 lb-f) thrust dry and 483 N (109 lb-f) with afterburner. The thrust specific fuel consumption ranged from 2.2 to 3.6.
MAJS: /*ENGINE DESIGN/*JET THRUST/*LOW COST/*REMOTELY PILOTED VEHICLES/*THRUST AUGMENTATION/*TURBOJET ENGINES

77A47346
UTTL: An alternate recovery system for the Aquila
AUTH: A/SEEMANN, G. R.; B/PHILLIPS, K. L.; C/HARRIS, G. L.; D/KRACHMAN, H. E.; E/HERTENSTEIN, J.; F/BROWN, G.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 85-88.
ABS: A soft-landing variant recovery system for the Aquila mini-RPV is described. A hydraulic drag brake arrangement is employed for test horizontal deceleration and an air mattress to facilitate vertical deceleration. The arrangements can be set up within 2 hr and dismantled within 2 hr. The RPV can be hauled to launch site and from recovery site in a pickup truck.
MAJS: /*AIRCRAFT BRAKES/*DECELERATION/*RECOVERABLE LAUNCH VEHICLES/*REMOTELY PILOTED VEHICLES/*SOFT LANDING/*VERTICAL LANDING

77A47345
UTTL: Multiple Drone Control development
AUTH: A/WINKLER, R. E.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 79-84.
ABS: This paper discusses the development of the Multiple Drone Control (MDC) System and its application in the use of multiple RPVs for operational EW missions. The system evolution from one-on-one control, using the AN/UPQ-3 Microwave Command Guidance System (MCGS), to the Multiple Drone Control/Strike System (MDC/SS) is described. MDC/SS, currently completing DT&E and IOT&E flight testing, is discussed, including flight test results and operational capabilities. Other potential applications of the current configuration are noted and possible future evolution of the system is discussed.
MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*DRONE VEHICLES/*ELECTRONIC CONTROL/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

77A47344
UTTL: Development of an ultra-low-cost gas turbine
AUTH: A/BAERST, C. F.; B/NORGREN, W. M.
In: The RPV - Complement to manned systems: Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 71-78. USAF-supported research.
ABS: By utilizing the aerodynamic components from a high-production, low-cost truck engine turbocharger, a new generation of ultra-low-cost turbine engines is developed. A series of engines in the 100- to 200-pound thrust class, under development by Garrett/AiResearch, is presented. One engine is a simple conversion of the Model T-18A turbocharger to an engine with 100-pounds thrust. A second version redesigns the turbine and adds a sudden expansion burner for augmentation and produces about 200-pounds thrust. Both engines were fabricated and successfully run in sea-level thrust stands. Testing of these prototypes proved the performance capability of this concept and provided the basis for future engine development.
MAJS: /*ENGINE DESIGN/*ENGIN. TESTS/*GAS TURBINE ENGINES/* LOW COST/*REMOTELY PILOTED VEHICLES/*TURBOJET ENGINES

77A47343
UTTL: Synergistic growth of ITCS to a tactical RPV C2 system
AUTH: A/DARROW, D.
In: The RPV - Complement to manned systems: Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 66-70. Navy-supported research.
ABS: This paper presents a brief technical overview and summary of test results on the Integrated Target Control System (ITCS) developed by Motorola under contract to Naval Air Systems Command. A wideband anti-jam data link developed under a Motorola Independent Research and Development program is also discussed. ITCS was developed as a set of control stations operating at ranges to 250 nautical miles and associated target avionics. It is the most modern, operational, integrated system in existence today for command, control, and tracking of unpiloted vehicles. The technology and hands-on experience gained from the ITCS program are directly applicable to tactical RPV command, control, and information transfer problem. The proven hardware and operational experience gained from ITCS coupled with demonstrated hardware and state-of-the-art technology from the Motorola anti-jam wideband data link provide the basis for an advanced design, high performance, cost effective RPV command, control, and information transfer system.
MAJS: /*AVIONICS/*COST EFFECTIVENESS/*ELECTRONIC CONTROL/* REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION

77A47342
UTTL: The mini-RPV, cost effectiveness in a tactical environment
AUTH: A/ROSE, E. A., JR.; B/BUDIANSKY, J. H.
In: The RPV - Complement to manned systems: Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 59-65.
ABS: A cost effectiveness analysis to examine RPV deployment in defense suppression, 'loiter mine' and jamming is described. Scenarios are used to develop rationale for cost effectiveness tradeoffs that demonstrate aid to manned systems in the battlefield. Mission profiles in hypothetical but reasonable European scenarios are used as a background for the analysis. Examples of low cost component technology and manufacturing techniques being used to develop operational systems, and representative RPV hardware, are included.
MAJS: /*COST EFFECTIVENESS/*DEPLOYMENT/*ENVIRONMENT MODELS/* FIGHTER AIRCRAFT/*REMOTELY PILOTED VEHICLES

77A47341
UTTL: Tethered hover flight tests of a vertical attitude takeoff and landing remotely piloted vehicle
AUTH: A/EILERTSON, W. H.
In: The RPV - Complement to manned systems: Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 50-58.
ABS: Vertical attitude takeoff and landing offers attractive advantages to the Navy in that ship interface problems are alleviated. A 560-lb demonstration vehicle was designed to assess these advantages. This vehicle will be flight tested to assess vertical hover capability in the turbulent aerodynamic wake generated by a ship's superstructure while underway. The design incorporates a close coupled canard/delta wing configuration. Components from the Harpoon missile are utilized. Tethered flight tests in hover were recently demonstrated successfuly.
MAJS: /*FLIGHT TESTS/*HOVERING/*REMOTELY PILOTED VEHICLES/* TETHERING/*VERTICAL LANDING/*VERTICAL TAKEOFF

77A47340
UTTL: Selection of optimum RPV operational launch and recovery techniques
AUTH: A/POTOCKI, W. J.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 41-49.
ABS: A qualitative study of production, technology, and cost control problems in working out optimum launch and recovery techniques for combat RPVs (remotely piloted vehicles) is presented. Cost/benefit/risk analysis and life cycle cost analysis studies are described. Candidate systems and hardware for RPV launch and ecovery operations are listed and compared. The study is recommended as an attack on problems not amenable to detailed quantitative procedures, while offering reasonably rapid convergence to the most appropriate candidates to be given closer attention in system development.
MAJS: /*AIRCRAFT DESIGN/*COST ANALYSIS/*LAUNCHING/*PRODUCTION ENGINEERING/*RECOVERABLE LAUNCH VEHICLES/*REMOTELY PILOTED VEHICLES

77A47339
UTTL: U.S./F.R.G. advanced tactical RPV requirements as analyzed by Boeing and Dornier
AUTH: A/OBRIAN, D. J.; B/SCHWEIZER, P. H.; C/SPINTZYK, J.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 33-40.
ABS: Tactical combat requirements for effective use of remote piloted vehicles (RPV) are assessed for a central European scenario. Reliance on RPVs is found best advised when combat attrition rates are hign and a certain range of fixed or transient targets are to be engaged; mixes of RPVs and manned aircraft are considered. Alert capability, survivability on the ground, 24-hr all-weather capability, and RPV use as escorts and precursors are highlighted. Recommended recon missions include: detailed zone reconnaissance of concentrated armor, area activity sampling along communication routes, and bomb damage assessment after strikes. Low cost, modest personnel requirements, and saving of trained personnel for other tasks are emphasized.
MAJS: /*AIRCRAFT DESIGN/*COST EFFECTIVENESS/*DESIGN ANALYSIS/*REMOTELY PILOTED VEHICLES/*USER REQUIREMENTS/*WEAPON SYSTEMS

77A47338
UTTL: The development of the XMQM-105 Aquila mini-RPV system
AUTH: A/SCHNEBLY, F. D.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 24-32.
ABS: The Army's Aquila program began in January 1975 with the objective of demonstrating the application of mini-RPV technology to missions of surveillance, artillery fire adjustment and laser designation. This paper reviews major events during the course of the program with emphasis on technical, scheduling and programmatic aspects. Particular emphasis is placed on the system aspects of mini-RPVs and innovative test approaches. Film and video highlights of launch and recovery operations are shown along with imaging data from onboard sensors.
MAJS: /*GROUND BASED CONTROL/*RECOVERABLE LAUNCH VEHICLES/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*SURVEILLANCE

77A47337
UTTL: Tactical expendable drone system /TEDS/
AUTH: A/CAPERTON, O. H.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 19-23.
ABS: Tactical combat uses of TEDs (tactical expendable drones) in strike and support missions are outlined, and results of validation and flight tests are presented. Decoy service against hostile AAA and/or SAM, ceployment as a diversionary decoy strike force, penetration aid as area-distributed jammer, and target acquisition support applications are described. Saturation and dilution of hostile defense systems are emphasized. Production, storage, maintenance, combat deployment, and launches of TEDs are outlined.
MAJS: /*AIR LAUNCHING/*DECOYS/*DRONE VEHICLES/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION

77A47336
UTTL: RPV applications of Tomahawk cruise missile
AUTH: A/LYNCH, R. A.; B/SUTLIFF, J. D.; C/MURPHY, L. E., JR.; D/KARMAZIN, W. R.
In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely

Piloted Vehicles, 1977, p. 13-18.

ABS: The versatility and durability of the Tomahawk cruise missile incorporated into an RPV system are recommended. Originally designed for submarine launch, the Tomahawk in its RPV format can be launched from ground, vehicles, shipboard, or aircraft, with a quick-disconnect 1000-lb payload and a range of 1500 nautical mi. Recoverability and prompt reusability are additional advantages of the weapon system. Reconnaissance, jamming and chaffing nuisance missions, and strikes against hard targets and sheltered or revetted aircraft are possible applications.

MAJS: /*CRUISE MISSILES/*MISSILE LAUNCHERS/*REMOTELY PILOTED VEHICLES/*REUSABLE LAUNCH VEHICLES/*TARGET ACQUISITION

77A47335

UTTL: Operational concept for a battlefield surveillance RPV system /Canadair CL-227/

AUTH: A/KEZR, J. P.

In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 8-12.

ABS: An operational concept is described for a battlefield surveillance RPV system designed to provide field commanders with an organic capability for real-time surveillance over enemy terrain; immediate acquisition of targets and fire adjustment-target designation. The RPV system comprises Control Stations, RPV Stations and RPV's with Payloads; it is the Canadair CL-227 system. The systems characteristics provide the basis for an operational concept whereby RPV preparation, take-off, landing and servicing is undertaken well to the rear while control during a mission is exercised by a forward station. The phases of such an operation are described together with a maintenance concept.

MAJS: /*GROUND BASED CONTROL/*REAL TIME OPERATION/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*SURVEILLANCE/*TARGET ACQUISITION

77A47334

UTTL: Complementary roles for RPVs in support of tactical manned aircraft

AUTH: A/ZRAKET, C. A.; B/ROSE, S. E.

In: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977. (A77-47333 22-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977, p. 1-7.

ABS: As a result of new technology in computer, sensor and communications electronics, it is feasible for the aircrew of tactical strike aircraft to control a supporting force of 'smart' RPVs which are able to operate semi-autonomously in a number of missions without continual remote control. The RPVs have the inherent capability to electronically sense the threat environment, take self-initiated evasive maneuvers and transmit this data to other RPVs and the manned aircraft. By providing this information to the data-processing capability distributed among the aircraft, the RPVs and ground tactical control centers, it will be feasible, in real time, to reconfigure the overall attack against the most recently perceived threat. The use of RPVs in support of tactical manned aircraft promises to significantly reduce the cost and to increase the size and effectiveness of the total fleet.

MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*AIRCRAFT MANEUVERS/*COST REDUCTION/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*SURVEILLANCE

77A47333

UTTL: The RPV - Complement to manned systems; Proceedings of the Fourth Annual Symposium, Washington, D.C., June 5-9, 1977

Symposium sponsored by the National Association for Remotely Piloted Vehicles. Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1977. 182 p (For individual items see A77-47334 to A77-47354)

ABS: Attention is given to complementary roles for RPVs in support of tactical manned aircraft, an operational concept for a battlefield surveillance RPV system (Canacair CL-227), RPV applications of the Tomahawk cruise missile, and the Aquila mini-RPV program. The selection of optimum RPV operational launch and recovery techniques, tethered hover flight tests of a vertical attitude takeoff and landing RPV, the development of an ultra-low-cost gas turbine for RPV applications, and the development of the Multiple Drone Control System are also considered.

MAJS: /*CONFERENCES/*FIGHTER AIRCRAFT/*RECOVERABLE LAUNCH VEHICLES/*REMOTELY PILOTED VEHICLES

77A44443

UTTL: The remotely piloted helicopter

AUTH: A/FAULKNER, A. J.; B/SIMONS, I. A.

Vertica, vol. 1, no. 3, 1977, p. 231-238.

ABS: This article describes some of the fundamental problems associated with current fixed wing remotely piloted vehicles, particularly during launch and recovery, and introduces the idea of a small remotely

piloted helicopter in the role of real time surveillance and reconnaissance. It is argued that a co-axially rotored helicopter with a plan-symmetric fuselage is the most suitable configuration for remote piloting as it offers the simplest form of pilot controls, minimises rotor cross-couplings and permits a cartesian mode of operation. The problems associated with the aerodynamic shape of the fuselage are indicated and the importance of automatic stabilization is discussed in some detail. Finally a brief account is given of some experimental flight testing carried out on a small scale co-axial helicopter.

MAJS: /*AIRCRAFT CONFIGURATIONS/*HELICOPTER CONTROL/*HELICOPTER DESIGN/*REMOTELY PILOTED VEHICLES

77A44082

UTTL: Solution of the basic problem of discontinuous dynamic system control

AUTH: A/ZARIPOV, N. G.; B/SIRAZETDINOV, T. K.

(Aviatsionnaia Tekhnika, vol. 19, no. 4, 1976, p. 46-52.) Soviet Aeronautics, vol. 19, no. 4, 1976, p. 36-41. Translation.

ABS: (For abstract see issue 14, p. 2395, Accession no. A77-32082)

MAJS: /*CONTROL THEORY/*DYNAMIC CONTROL/*FLIGHT CONTROL/*NONLINEAR SYSTEMS/*REMOTELY PILOTED VEHICLES

77A42776

UTTL: Vertical landing attitude control of a remotely piloted vehicle using jet vanes in the engine exhausts

AUTH: A/PULK, B. E.; B/STOLARIK, E.

In: Guidance and Control Conference, Hollywood, Fla., August 8-10, 1977, Technical Papers. (A77-42751 20-35) New York, American Institute of Aeronautics and Astronautics, Inc., 1977, p. 206-212.

ABS: An attitude control system for a remotely piloted vehicle is investigated. The RPV is a vertical takeoff and landing vehicle which is to be operated from a non-aviation ship. The RPV lands with its two wing tip mounted engines tilted vertically, providing all of the RPV's lift. Since the conventional aerodynamic control surfaces are ineffective during the low speed vertical landing, control is achieved by deflecting jet vanes in the high energy engine exhausts. Jet vane control effectiveness, as well as simulation results of the RPV landing maneuver, are discussed.

MAJS: /*ATTITUDE CONTROL/*JET ENGINES/*JET VANES/*REMOTELY PILOTED VEHICLES/*VERTICAL LANDING/*VERTICAL TAKEOFF

77A41929

UTTL: The future of rotorcraft in aviation

AUTH: A/JONES, J. P.

In: The place of aviation in society; Proceedings of the Fifteenth Anglo-American Aeronautical Conference, London, England, May 31-June 2, 1977. (A77-41926 19-03) London, Royal Aeronautical Society, 1977. 15 p.

ABS: The evaluation concerning the future of rotorcraft takes into account the conventional helicopter, the supersonic rotor helicopter, the tilt (wing) rotor, and remotely piloted helicopters. With respect to the conventional helicopter, it is expected that new developments will more than double its cost-effectiveness. The aerodynamic problems of the helicopter disappear if rotation at supersonic tip speeds is employed. There are, however, problems of increased noise and power consumption for the supersonic rotor helicopter, which will probably limit its use to military applications. Convertible rotorcraft have possibly the best technical chance of finding a civil market, but the investment requirements are high. Remotely piloted helicopters require a long period of engineering development work, which will probably only be performed in connection with extended military service.

MAJS: /*COST EFFECTIVENESS/*HELICOPTER DESIGN/*REMOTELY PILOTED VEHICLES/*ROTORCRAFT AIRCRAFT/*TECHNOLOGICAL FORECASTING/*TILT ROTOR AIRCRAFT

77A40060

UTTL: The concept of remotely piloted helicopters

AUTH: A/SIMONS, I. A.

In: American Helicopter Society, Annual National Forum, 33rd, Washington, D.C., May 9-11, 1977, Proceedings. (A77-40048 18-01) Washington, D.C., American Helicopter Society, Inc., 1977. 12 p.

ABS: The features required in, and some of the problems associated with, a battlefield surveillance system utilising a mini-rpv are reviewed and a case is made for the use of a helicopter in this role. A plan-symmetric, coaxial rotor helicopter is proposed and its advantages and disadvantages are pointed out. In particular its flight control system and flight characteristics are discussed in some detail. The small research remotely-piloted helicopters of this type built by Westland Helicopters are described and finally mention is made of a more sophisticated project presently under construction.

MAJS: /*HELICOPTER DESIGN/*MILITARY HELICOPTERS/*RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES

77A39519
UTTL: Project work on a strike RPV
AUTH: A/SPINTZYK, J.
Dornier-Post (English Edition), no. 2, 1977, p. 26-29.
ABS: A proposal for a highly cost-effective strike RPV with high deterrent value is outlined. The RPV is intended for launch from rear fields for sorties against previously reconnoitred mobile or fixed targets. Both outward and return flight are pre-programmed and take place near the ground at high speeds. Low-level bombing is carried out without terminal guidance. Landing is automatic. A hybrid navigation system, with a strapdown inertial system for air-derived navigation, is under consideration. A configuration with fuselage-stored weapons and external engines appears suitable.
MAJS: /*ATTACK AIRCRAFT/*REMOTELY PILOTED VEHICLES

77A39518
UTTL: Drone and RPV programmes at Dornier
AUTH: A/KLAAR, W.
Dornier-Post (English Edition), no. 2, 1977, p. 17-21.
ABS: Remotely Piloted Vehicle (RPV) development programs have undergone a gradual change of objectives. The original expectation that the problem of vulnerability of manned aircraft could be completely circumvented by the use of RPVs has ceded to interest in the development of RPVs for somewhat more modest tasks to be performed on a largely automated mission requiring a minimum amount of intervention from the remote pilot. RPV programs and applications under consideration or in progress for the armies, navies and air forces of the NATO countries are briefly discussed. The advantages of international cooperation in RPV development are outlined.
MAJS: /*DRONE VEHICLES/*REMOTELY PILOTED VEHICLES

77A38591
UTTL: Low cost RPV booster
AUTH: A/STEPHEN, W. A.; B/SCHOEN, L. L.; C/EATOUGH, R. G.
American Institute of Aeronautics and Astronautics and Society of Automotive Engineers, Propulsion Conference, 13th, Orlando, Fla., July 11-13, 1977, AIAA 6 p.
ABS: Low cost RPV operation requires use of a simple cost effective booster system. The cost of a solid rocket booster can be significantly reduced by use of a nozzleless motor configuration. The nozzleless concept feasibility has been demonstrated and evaluated in quite some detail. However, until recently, methods for steering the nozzleless motor had not been defined. CSS, in conjunction with TRW, has demonstrated the capability of integrating the nozzleless motor and thrust vector control (TVC) system to provide a low cost method of an advanced RPV. This propulsion system offers the U.S. Air Force a system which will meet the performance requirements, and significantly surpass service life estimate of the system.
MAJS: /*BOOSTER ROCKET ENGINES/*COST REDUCTION/*NOZZLELESS ROCKET ENGINES/*REMOTELY PILOTED VEHICLES/*ROCKET ENGINE DESIGN/*SOLID ROCKET PROPELLANTS/*THRUST VECTOR CONTROL

77A37379
UTTL: Advantages of a time division multiplex data bus for remotely piloted vehicle built-in-test
AUTH: A/QUALLS, L. R.
In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. (A77-37352 17-33) New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 203-207.
ABS: Avionics systems in new weapon systems such as the F-16 use a digital time division multiplex technique to integrate sensors, computers, and displays. This technique, as outlined in the MIL-STD-1553 Internal Aircraft Time Division Multiplex Data Bus, can also be used to centralize Built-in-Test (BIT) during pre-flight and in-flight checks. This paper describes the support concepts required for Avionics Systems integrated with a MIL-STD-1553 Data Bus. The unique features of a MIL-STD-1553 system, command-response message format, and allocated mode command and composition of the system status word, are reviewed. Advantages of the MIL-STD-1553 Data Bus for Built-in-Test are described.
MAJS: /*AVIONICS/*CHANNELS (DATA TRANSMISSION)/*REMOTELY PILOTED VEHICLES/*TEST EQUIPMENT/*TIME DIVISION MULTIPLEXING

77A37365
UTTL: A new ASD approach to avionic systems engineering
AUTH: A/GIFFORD, C. A.
In: NAECON '76; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, May 18-20, 1976. (A77-37352 17-33) New York, Institute of Electrical and Electronics Engineers, Inc., 1976, p. 96-99.
ABS: A study team concept to avionic systems engineering is described which includes literature searches, independent analyses, and avionics configuration hot benching. Particular attention is given to the use of both mini and major hot benching in the advanced

remotely piloted vehicle program.
MAJS: /*AVIONICS/*MILITARY AVIATION/*REMOTELY PILOTED VEHICLES/*SYSTEMS ENGINEERING

77A35022
UTTL: A naval VATOL RPV in testing
AUTH: A/EILERTSON, W. H.
Astronautics and Aeronautics, vol. 15, June 1977, p. 30-37.
ABS: Progress in light-weight electronics has caused the Navy to assess the advantages that might accrue from the use of remotely piloted vehicles (RPVs). Analyses indicate that RPVs can be 60% lighter and cost only a third as much as comparable manned aircraft intended for similar missions. RPVs would improve the Navy's air support and favorably complement manned aircraft. They could be designed to fly long-endurance missions (free of constraints imposed on manned aircraft) and to be highly maneuverable against heavily defended targets. They would not, however, replace manned aircraft in support missions requiring high reliability in engaging targets posing an immediate threat to the fleet. In the present paper, tests are described which demonstrated the advantages of vertical-attitude takeoff and landing (VATOL) over other approaches to launching and recovering RPVs.
MAJS: /*COST REDUCTION/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES/*VERTICAL LANDING/*VERTICAL TAKEOFF AIRCRAFT /*WEIGHT REDUCTION

77A34931
UTTL: Tethered hover tests of the XBQM-108A vertical attitude takeoff and landing demonstration vehicle
AUTH: A/EILERTSON, W. H.
In: V/STOL Conference, Palo Alto, Calif., June 6-8, 1977, Technical Papers. (A77-34926 15-05) New York, American Institute of Aeronautics and Astronautics, Inc., 1977, p. 22-30.
ABS: Vertical attitude takeoff and landing (VATOL) offers an attractive solution to the launch and recovery of Navy RPVs as well as future manned V/STOL aircraft aboard ships. This paper reviews the DTNSRDC VATOL program with attention given to the demonstration vehicle, guidance and control, aerodynamic characteristics in hover, and jet vane performance. Particular attention is given to flight simulation-hover flight phase and tethered hover flight tests.
MAJS: /*FLIGHT TEST VEHICLES/*HOVERING STABILITY/*REMOTELY PILOTED VEHICLES/*VERTICAL LANDING/*VERTICAL TAKEOFF AIRCRAFT

77A32C82
UTTL: Contribution to the solution of the basic control problem for a discontinuous dynamic system
AUTH: A/ZARIPOV, N. G.; B/SIRAZETDINOV, T. K.
Aviatsionnaia Tekhnika, vol. 19, no. 4, 1976, p. 46-52. In Russian.
ABS: A solution is obtained to the problem of constructing a control process described by a discontinuous system of differential equations, such that the phase coordinates, or the values of certain functionals, come to lie within a prescribed region. The problem of determining such parameters of a remotely-controlled craft as the load at the mid-section of the fuselage and the moment of starting the engine is examined as an example.
MAJS: /*CONTROL THEORY/*DYNAMIC CONTROL/*FLIGHT CONTROL/*NONLINEAR SYSTEMS/*REMOTELY PILOTED VEHICLES

77A28982
UTTL: A critical comparison of fast transforms for image data compression
AUTH: A/GRISWOLD, N. C.; B/HARALICK, R. M.
In: Advances in image transmission techniques; Proceedings of the Seminar, San Diego, Calif., August 24, 25, 1976. (A77-28963 12-32) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 180-188.
ABS: With application to imagery for RPVs, a number of transformed coding compressions using six bit 512 x 512 images with 16 x 16 windows for various transforms have been compared. In order of worst to best performance, the transforms were Hadamard, Fourier, slant, discrete linear basis, discrete cosine, and fast Karhunen Loeve. Good performance was achieved for the three latter transforms for compression ratios of 12:1 or 1/2 bit per pixel.
MAJS: /*AIRCRAFT COMMUNICATION/*DATA COMPRESSION/*REMOTELY PILOTED VEHICLES/*SIGNAL ENCODING/*TRANSFORMATIONS (MATHEMATICS)

77A28970
UTTL: Video link data compression for remote sensors
AUTH: A/ESSMAN, J. E.; B/HUA, Q. D.; C/GRISWOLD, N. C.
In: Advances in image transmission techniques; Proceedings of the Seminar, San Diego, Calif., August 24, 25, 1976. (A77-28963 12-32) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 55-77.
ABS: This paper summarizes a research study on data compression techniques applicable for Remote Piloted Vehicles (RPV). Interframe techniques are considered and algorithms are determined to account for motion in

frame-to-frame aerial photographs resulting in large bit reduction ratios provided that the various parameters of the mission such as altitude, velocity, etc. are accurately known. Differential encoding is used to further reduce bandwidth. Intraframe techniques suitable for the RPV mission including two-dimensional transform techniques and hybrid coding schemes are investigated and evaluated. It is shown that the hybrid schemes using Hadamard transform in one spatial direction and DPCM in the other spatial direction performs equivalent and at times superior to 2-dimensional transform techniques. The effects of channel errors on both the transform and hybrid coding schemes are investigated. Although the hybrid coding scheme is shown to be more sensitive to noise, optimization of the prediction coefficient results in satisfactory performance in a noisy environment. An adaptive scheme is considered which shows improved resolution in regions of high activity within the picture.

MAJS: /*DATA COMPRESSION/*DATA LINKS/*REMOTE SENSORS/* REMOTELY PILOTED VEHICLES/*VIDEO DATA

77A28968

UTTL: RPV video communications - A new challenge to video data compression

AUTH: A/WANG, R. T. P.

In: Advances in image transmission techniques; Proceedings of the Seminar, San Diego, Calif., August 24, 25, 1976. (A77-28963 12-32) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 36-46.

ABS: The paper examines the general scenario in which the RPV video capability will be used, with emphasis on video information content and visual search. Attention is given to such video data compression techniques as slow frame rate TV, hybrid transform/DPCM algorithm, the Hadamard transform algorithm, and source information adaptive coding

MAJS: /*AIRCRAFT COMMUNICATION/*DATA COMPRESSION/*REMOTELY PILOTED VEHICLES/*VIDEO COMMUNICATION/*VIDEO DATA

77A28967

UTTL: Adaptive Haar transform video bandwidth reduction system for RPV's

AUTH: A/REIS, J. J.; B/LYNCH, R. T.; C/EUTMAN, J.

In: Advances in image transmission techniques; Proceedings of the Seminar, San Diego, Calif., August 24, 25, 1976. (A77-28963 12-32) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 24-35.

ABS: A video bandwidth compression system for RPVs, based on the fast two-dimensional Haar transform and an adaptive compression technique, is described. After the video signals are Haar-transformed, the resulting transform coefficients are adaptively filtered to achieve transmission data rates to less than 1 bit/pel, while maintaining good picture quality.

MAJS: /*AIRCRAFT COMMUNICATION/*BANDWIDTH/*DATA COMPRESSION /*REMOTELY PILOTED VEHICLES/*TRANSFORMATIONS (MATHEMATICS)/*VIDEO COMMUNICATION

77A28209

UTTL: The HiMAT RPRV propulsion control system

AUTH: A/BAYATI, J. E.

Society of Automotive Engineers, Aerospace Engineering and Manufacturing Meeting, San Diego, Calif., Nov. 29-Dec. 2, 1976. 10 p.

ABS: The paper describes the multimode propulsion control system concept developed for Phase III of the Highly Maneuverable Aircraft Technology (HiMAT) program. Control requirements are discussed, and a block diagram of the airborne integrated control system is provided. Consideration is given to thrust response, multimode control, the main fuel control, the afterburner fuel control, and the throttle and jet-nozzle actuation systems. Ground-pilot tasks and aids are briefly outlined.

MAJS: /*AIRCRAFT CONTROL/*FIGHTER AIRCRAFT/*PROPULSION SYSTEM PERFORMANCE/*REMOTELY PILOTED VEHICLES/* TURBOJET ENGINE CONTROL

77A23539

UTTL: A night photo system for remotely piloted vehicles

AUTH: A/LAPP, H. S.

In: Aerial reconnaissance systems: Proceedings of the Seminar, Reston, Va., March 24, 25, 1976. (A77-23517 09-35) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976, p. 174-178.

ABS: The Air Force Avionics Laboratory has developed a night photo system designated as the KS-126A. The KS-126A was designed for the weight-power and size constraints associated with RPV aircraft. The system consists of a pulsed illuminator synchronized to a single 70mm camera. The camera is unique in two respects: (1) one tube; (2) the camera makes use of a rotating carousel or turntable having three prisms, each one providing a 40 x 40 inch view of the ground. The system was delivered in an RF4C centerline pod so that flight testing could be effectively accomplished by a controllable high performance aircraft. Results of experiments to simulate the RPV flight environment in a ground dynamic analyzer and the RF4C centerline

pod will be discussed. Also the flight test results and KS-120/BGM-34C vehicle interface problems will be addressed.

MAJS: /*AERIAL PHOTOGRAPHY/*FLIGHT TESTS/*FRAMING CAMERAS/*INFRARED PHOTOGRAPHY/*NIGHT FLIGHTS (AIRCRAFT)/*REMOTELY PILOTED VEHICLES

77A23521

UTTL: RPV sensor system interface

AUTH: A/HODGES, H. N.

In: Aerial reconnaissance systems; Proceedings of the Seminar, Reston, Va., March 24, 25, 1976. (A77-23517 09-35) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1976. p. 28-34.

ABS: Remotely Piloted Vehicles (RPVs) are versatile aerial platforms which can be piloted by radio link from a remote control point. The latest model features a removable modular nose designed to carry a variety of payloads for reconnaissance, electronic warfare and strike missions. This paper describes the interface of three sensor systems to RPVs - the KS-120 camera, the Perkin-Elmer KA-98 prototype laser line scanner and the prototype Philco Ford laser target designator. The interface to the modular nose YBGM-34C multi-mission RPV is discussed along with the interfaces to the BGM-34B and AQM-34M RPVs. A brief history of reconnaissance RPVs is given.

MAJS: /*AERIAL RECONNAISSANCE/*DATA COLLECTION PLATFORMS/*RECONNAISSANCE AIRCRAFT/*REMOTE SENSORS/*REMOTELY PILOTED VEHICLES

77A20867

UTTL: Attitude control of a pilotless aircraft by radioactive probes

AUTH: A/BOULAY, J.-L.; B/LARIGALDIE, S.

(NATO, AGARD, Reunion sur l'Instrumentation et le Guidage des Avions sans Pilote, Florence, Italy, Oct. 4-8, 1976.) ONERA, TP no. 1976-112, 1976. 11 p. In French.

ABS: The servocontrol of the attitude of an RPV can be based on the natural electric field within the atmosphere. The vehicle movements are detected, around the roll and pitch axes, by means of radioactive probes installed at the wing tips and at the front and back ends of the fuselage. The electric signals provided by these probes are preprocessed, then mixed with the orders from the ground and directed to the aircraft servocontrols. The study presented in this paper is mainly oriented towards the understanding of the physical mechanisms intervening in the use of radioactive probes, and on the perturbations due to spurious electric charges generated by the engine exhaust gases.

MAJS: /*ATTITUDE CONTROL/*RADIATION DETECTORS/*RADIOACTIVE MATERIALS/*REMOTELY PILOTED VEHICLES/*SERVOCONTROL

77A20662

UTTL: Navigation for sea based RPVs

AUTH: A/NEWMAN, L.

In: New frontiers in aerospace navigation; Proceedings of the Bicentennial National Aerospace Symposium, Warminster, Pa., April 27, 28, 1976. (A77-20655 07-04) Washington, D.C., Institute of Navigation, 1976. p. 48-51.

ABS: Navigation instrumentation is necessary for each mission of sea-based remotely piloted vehicle (RPV). The paper examines the impact of each phase of the mission, including launch at sea, traversal to the operations area, critical mission flight operations, and at sea recovery. Constraints resulting from the use of existing navigation techniques are identified. Launched from a carrier, RPV navigation systems requiring preflight data loading and initialization procedures have the benefit of support systems available for similar functions aboard manned aircraft. The journey to the operations area may be navigated using a variety of methods ranging from remote control for line-of-sight operations to completely preprogrammed flight controls for over-the-horizon traversals. Included in the discussion are additional design requirements and limitations on RPV navigation system alternatives. It is concluded that the constraints and requirements peculiar to sea-launched RPVs will challenge the limits of the state of the art of navigation.

MAJS: /*MARINE TECHNOLOGY/*MILITARY OPERATIONS/*NAVIGATION INSTRUMENTS/*REMOTELY PILOTED VEHICLES/*SEA LAUNCHING

77A20628

UTTL: B.A.C. experience with small fixed wing and rotary wing R.P.Vs

AUTH: A/STEPHENSON, R.

In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 14 p.

ABS: A description is given of research programs conducted with the aid of the Big-Wig model aircraft. The aircraft has a high wing of 2 meters span and a useful payload of about 2 kg. An investigation of electrostatic autostabilization techniques is reported. Other experiments were related to the use of an optical beam riding system to guide a remotely piloted vehicle. The development of a mini-RPV for

surveillance or defense suppression roles is discussed along with the selection of a suitable model for rotary wing development studies. The selected model was modified to improve its payload capacity while retaining mechanical reliability.

MAJS: /*FIXED WINGS/*REMOTELY PILOTED VEHICLES/*RESEARCH AND DEVELOPMENT/*ROTARY WING AIRCRAFT

77A20627

UTTL: Skyspy - A ducted RPV fan

AUTH: A/RANSOM, H. S.

In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 10 p.

ABS: The essential elements of Skyspy include a fan, an engine to drive it, a duct enclosing the fan, control surfaces in the jet, and the closed loop control systems and sensors to govern the pitch, roll, yaw, and axial motions of the airframe. The ability of Skyspy to hover or fly at very low speeds is an important factor in operations related to the surveillance of a static or slowly moving objective and search missions at low speeds. Higher forward speeds can be obtained by inclination of the complete airframe. The development of an experimental vehicle is discussed. Attention is also given to the employment of Skyspy as a relay station, details concerning its payload, aspects of vehicle control, and takeoff and landing operations.

MAJS: /*AIRCRAFT PERFORMANCE/*DUCTED FANS/*REMOTELY PILOTED VEHICLES/*SURVEILLANCE/*V/STOL AIRCRAFT

77A20626

UTTL: The Aerodyne - An R.P.V. with multiple capability

AUTH: A/WHITE, A. J.; B/HARMS, G.

In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 21 p.

ABS: The propulsion system of the Aerodyne uses a gas turbine engine to drive a ducted fan. The static thrust obtained is sufficient to carry the weight of the vehicle. Like the helicopter, the Aerodyne can hover, or take off and land vertically. For forward flight the flaps which direct the fan output are gradually changed to the horizontal. The development of an experimental Aerodyne vehicle by a German aerospace company is discussed. Aerodyne configurations for maritime and battlefield operations are considered and a description is presented of a system concept for battlefield operation. A computer in a command vehicle will be used for picture processing, Aerodyne tracking, mission planning, and for equipment testing and check-out.

MAJS: /*AIRCRAFT CONFIGURATIONS/*DUCTED FAN ENGINES/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*V/STOL AIRCRAFT

77A20625

UTTL: R.P.V. sensor data - A real time problem

AUTH: A/HOWE, M. B.

In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 7 p.

ABS: Technical and data handling problems associated with a use of imaging sensors in an RPV are discussed, taking into account as an example conditions in the case of the AN/USD 501 reconnaissance drone system and its projected successor the USD 502. Questions of suitable data display for an efficient information evaluation are discussed. Attention is given to the requirements of a generalized data transmission system, the sensor characteristics, and methods of storage and scan conversion. The digital converter is found to be the most attractive technically.

MAJS: /*AVIONICS/*DATA SYSTEMS/*OPERATIONAL PROBLEMS/*REAL TIME OPERATION/*REMOTE SENSORS/*REMOTELY PILOTED VEHICLES

77A20624

UTTL: The minimum R.P.V.

AUTH: A/ALLEN, D. W.

In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 10 p.

ABS: Questions related to the use of mini RPVs as test vehicles for the development and flight proving of small sensors and instruments are discussed. It is pointed out that such vehicles have also limited operational capability if they can be equipped with suitable sensing devices. Tests with a single rotor helicopter model are considered, taking into account approaches for overcoming certain control problems. Possibilities concerning the employment of fixed wing mini RPVs are also investigated, giving attention to the use of electrostatic autopilots of various designs.

MAJS: /*AIRCRAFT INSTRUMENTS/*REMOTE SENSORS/*REMOTELY PILOTED VEHICLES/*TEST VEHICLES

77A20623
UTTL: Convertible aircraft
AUTH: A/SIMPSON, W. D.
In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 14 p.
ABS: A convertible aircraft is defined as a machine which can be flown manned, but with a manual or remote override so that it may be controlled as an RPV. In addition, it may also be flown unmanned as a conventional RPV. Unmanned convertibles can be controlled either by a ground operator or from a manned convertible. The basic aircraft will be a low cost, light fixed wing machine probably powered by a piston engine. Suitable design characteristics for convertible aircraft are considered. Attention is given to the operational use of convertible aircraft by the Army and the Navy.
MAJS: /*AIRCRAFT DESIGN/*LIGHT AIRCRAFT/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES

77A20622
UTTL: Remotely piloted vehicles - The influence of system thinking on applied technology
AUTH: A/WESLEY, A. C.
In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 15 p.
ABS: A description of the characteristics of RPV systems is presented. Both fixed and rotating wing types are used. The range of overall systems extends from single controlled vehicles operated locally to multiple vehicles operated by complex command posts having control of many vehicles which may penetrate deeply into enemy country. Communication techniques and questions of navigation and flight control are also discussed along with electro-magnetic sensors and radar technology, electro-optical sensors, and aspects of data handling and processing.
MAJS: /*AVIONICS/*REMOTELY PILOTED VEHICLES/*SYSTEMS ANALYSIS

77A20621
UTTL: The R.P.V. in perspective
AUTH: A/MELLING, R.
In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 7 p.
ABS: The term RPV is used to cover a vehicle which incorporates some combination of remotely piloted, preprogrammed, and autonomous operating facilities. Factors leading to an unmanned aircraft are examined and suitable roles for the RPV are considered. The roles are related to target simulation, general surveillance, specific reconnaissance, artillery spotting, the creation of confusion, and jamming. Research and development problems are also discussed, taking into account engines, sensors, navigation, remote control, the data link, and aspects of launch and recovery.
MAJS: /*CIVIL AVIATION/*MILITARY AVIATION/*REMOTELY PILOTED VEHICLES

77A20620
UTTL: R.P.Vs in the maritime environment
AUTH: A/CLITHEROW, K. D. D.
In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 8 p.
ABS: A major threat to ships in the field of above water warfare at sea comes from missiles. A number of approaches utilizing RPVs can be employed in meeting such a threat. Attention is given to questions of target identification, the employment of RPVs for electronic countermeasures designed to destroy or deflect attacking missiles, the use of RPVs in antisubmarine warfare, RPV payloads, and problems related to the transportation of an RPV on a ship.
MAJS: /*ANTIMISSILE DEFENSE/*MARINE ENVIRONMENTS/*REMOTELY PILOTED VEHICLES

77A20619
UTTL: Remotely piloted vehicles - An Air Force view
AUTH: A/MITCHELL, J.
In: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings. (A77-20618 07-05) London, Royal Aeronautical Society, 1976. 11 p.
ABS: A description is given of the current operational roles of remotely piloted vehicles (RPV). RPV characteristics are examined, taking into account aspects of vulnerability/survivability, mission effectiveness, data links, guidance and control, and operational command and control. Flight regimes at low altitude, medium altitude, and high altitude are considered. Attention is given to reconnaissance, target acquisition and marking, electronic warfare, weapon delivery, air-to-air combat, defense suppression, RPV operating experience to date in the RAF, RPV problem areas, and the most fruitful areas for further study.
MAJS: /*AIR DEFENSE/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

77A20618
UTTL: Symposium on RPVs - Roles and Technology, London, England, January 27, 1976, Proceedings
Symposium sponsored by the Royal Aeronautical Society. London, Royal Aeronautical Society, 1976. 121 p
ABS: An Air Force view concerning remotely piloted vehicles is presented and RPVs in the maritime environment are considered. Attention is also given to an evaluation of the strengths and weaknesses of RPVs, the influence of system thinking on applied technology in the case of RPVs, U.S. Air Force RPV activity, convertible aircraft, the minimum RPV, RPV sensor data as a real time problem, the Aerodyne as an RPV with multiple capability, the ducted fan RPV Skyspy, and the experience of a British aerospace company with small fixed wing and rotary RPVs. Individual items are announced in this issue.
MAJS: /*CONFERENCES/*REMOTELY PILOTED VEHICLES

77A18502
UTTL: Automatic control system synthesis for longitudinal motion of a RPV
AUTH: A/DANEV, B.
Problemi na Tekhnicheskata Kibernetika, no. 4, 1976, p. 42-52. In Bulgarian.
ABS: A control system for longitudinal remotely piloted vehicle (RPV) motions is synthesized for three dynamic control modes: automatic stabilization, assigned mode, and control through the operator of a damping system. A structural arrangement is developed for the three control and stabilization modes. Introduction of a nonlinear element and its effect on mode of saturation and reduction of system gain are studied. Analog computer simulation of the system is discussed. Linear and nonlinear parts of the synthesis approach are delineated, and automatic variation of maximum system pitch with flight speed control is studied. Angular control and lateral control is also possible with the system developed.
MAJS: /*AIRCRAFT CONTROL/*AUTOMATIC FLIGHT CONTROL/*LONGITUDINAL CONTROL/*REMOTELY PILOTED VEHICLES

77A18252
UTTL: Unmanned aircraft in air warfare of the future
AUTH: A/SHILLITO, B. J.
American Institute of Aeronautics and Astronautics, Annual Meeting and Technical Display Incorporating the Forum on the Future of Air Transportation, 13th, Washington, D.C., Jan. 10-13, 1977, 13 p.
ABS: A case is presented for increased funding of research and development on remotely piloted vehicles (RPV) for tactical air support, reconnaissance, diversionary and attack operations, ECM, and defense against cruise missiles. Use of RPVs in Vietnam for recon, chaff, jamming ECM, and securing data on SAM fusing and detonating with no loss in personnel is reviewed. Future RPV and mini-RPV use in tactical air operations (laying minefields, overwhelming hostile defense radar net at selected points, attack RPVs on key targets, softening up for attack by manned aircraft, laying chaff corridors and jamming, ECM) is recommended, in addition to use as low-cost decoys, false target generators, and other spoofing missions. Expected advances will include: lower operating costs, all-weather vision, computer storage of decision-making routines, low IR signature and low radar cross section, and use of lasers, IR sensors, low light level devices, and compact high-resolution radar.
MAJS: /*AIRCRAFT DESIGN/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGICAL FORECASTING/*WARFARE

77A16545
UTTL: Methods and problems concerning the flight control of RPV's
AUTH: A/SCHMIDTLEIN, H.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Jahrestagung, 9th, Munich, West Germany, Sept. 14-16, 1976, 26 p. In German.
ABS: One objective of the considered RPV's is related to a replacement of aircraft in the case of missions which are particularly dangerous. Another objective of RPV employment is a lowering of the hazards to which aircraft are exposed by using RPV's before the aircraft mission. Both objectives involve a direct attack of hostile targets by RPV's. General operational and technical conditions of RPV employment are examined. It is recommended to develop low-cost RPV's for specific targets. Attention is given to the degree of automatization, questions of a disturbance of RPV missions by enemy action, a definition of three stages for the development of RPV systems, approaches for precise navigation, procedures for the automatic recognition of ground targets, the onboard system, and methods for the transmission of information between RPV and ground control unit.
MAJS: /*AIRCRAFT CONTROL/*ATTACK AIRCRAFT/*DEFENSE PROGRAM/*FLIGHT CONTROL/*REMOTELY PILOTED VEHICLES

77A16540
UTTL: Mobile data radio
AUTH: A/BAEUERLE, R.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Jahrestagung, 9th, Munich, West Germany, Sept. 14-16, 1976, 28 p. In German.
ABS: An investigation is conducted concerning the parameters which affect the quality of communication in the case of mobile transmitters and receivers. Questions of data transmission by radio in the VHF range between a stationary transmitter and a receiver which is in motion are discussed, taking into account aspects of radio wave propagation, transmission error characteristics, and problems of data transmission to low-flying flight vehicles as, for instance, remotely piloted vehicles.
MAJS: /*DATA TRANSMISSION/*FREQUENCY ASSIGNMENT/*GROUND-AIR-GROUND COMMUNICATIONS/*RADIO COMMUNICATION/*REMOTELY PILOTED VEHICLES/*TRANSMITTERS

77A12000
UTTL: VTOL RPVs - A technology assessment
AUTH: A/LINDENBAUM, B.
American Helicopter Society, Journal, vol. 21, Oct. 1976, p. 29-39.
ABS: Military uses and advantages of VTOL remotely piloted vehicles (RPV) and VTOL RPV development problems are discussed, along with the state of the art, means of RPV recovery and launch, and numerous VTOL concepts. The higher unit cost of VTOL systems is measured against the total system costs for non-VTOL craft (including: landing field or aircraft carrier construction costs and operating costs, ground transportation costs, accident rates), and VTOL advantages where no design accommodation for onboard crew is needed are emphasized (including feasibility of tail-sitter designs, size, availability of all known VTOL approaches). VTOL concepts considered and compared for RPV application include: jet lift, augmented thrust (with lift fan and ejector type flow augmenters), shrouded propeller/fans, open propeller/rotor, and VATOL (vertical attitude TOL - tail-sitter configuration).
MAJS: /*DRONE AIRCRAFT/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY ASSESSMENT/*VERTICAL TAKEOFF AIRCRAFT

77A11625
UTTL: 'C.22', the new French target drone
AUTH: A/LANGEREUX, P.
Air et Cosmos, vol. 14, Oct. 23, 1976, p. 24, 25. In French.
ABS: The C22 is a subsonic, remotely controlled, target drone of variable speed. It is to replace the target drones of the type CT20. It is expected that the mass production of the C22 will begin in 1981. The target drone is to be propelled by the turbojet engine TRI 60 which is also to be used in remotely piloted vehicles. The C22 will be employed with a towed target for gunnery-training exercises of antiaircraft artillery and for tests conducted with surface to air missiles. The C22 will be able to attain a speed of 0.95 Mach.
MAJS: /*AIRCRAFT DESIGN/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*SUBSONIC AIRCRAFT/*TARGET DRONE AIRCRAFT

76A46455
UTTL: The use of combination sequences in a multiple access environment
AUTH: A/MILSTEIN, L. B.
In: Annual Allerton Conference on Circuit and System Theory, 13th, Monticello, Ill., October 1-3, 1975. Proceedings. (A76-46454 24-59) Urbana, Ill., University of Illinois, 1976, p. 21-27.
ABS: The fundamental problem of code division multiple access communications is designing codes with good autocorrelation properties for each individual user while at the same time keeping the cross correlation between the codes of any two different users uniformly low. This paper develops a procedure for solving this problem, which consists of generating long codes by combining short sequences on a chip by chip basis using a logical combining law, and illustrates the procedure by applying it to multiple access communication involving a remotely piloted vehicle.
MAJS: /*AUTOCORRELATION/*BINARY CODES/*MULTIPLEXING/*REMOTELY PILOTED VEHICLES/*SIGNAL ENCODING/*TRANSMISSION EFFICIENCY

76A46263
UTTL: RPV developments plumb the field's potential
AUTH: A/KNACKE, T. W.
Astronautics and Aeronautics, vol. 14, Oct. 1976, p. 37-41.
ABS: Problems in the design and acceptance of remotely piloted vehicles (RPV) as military systems are surveyed. Major development programs of RPVs and mini-RPVs are described briefly. RPV applications in reconnaissance, strike missions, laser target designation, night sensor or weather sensor

operations. ECM, and data link service, as tactical warfare systems and carriers of area weapons supplementing both manned systems and standoff missiles, are examined. Command, control, communications, allocation of workload in military theaters, and RPV reliability, survivability, plus special problems to be resolved in the landing, launch, and retrieval of RPVs are discussed.

MAJS: /*AIRCR FT DESIGN/*COST EFFECTIVENESS/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES

76A45831

UTTL: A CAQ bandwidth reduction system for RPV video transmission

AUTH: A/PEARSON, J. J.
In: Efficient transmission of pictorial information; Proceedings of the Seminar, San Diego, Calif., August 21, 22, 1975. (A76-45826 23-32) Palos Verdes Estate, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 101-107.

ABS: A bandwidth compression system for the transmission of video images from remotely piloted vehicles has been built and demonstrated. Novel features of this system are the use of the Constant Area Quantization (CAQ) technique to obtain spatial bit rate reduction of 6:1 and a rugged and compact scan convertor, based on a core memory, to accommodate temporal frame rate reduction. Based on the ability of the human eye to perceive more detail in high contrast regions than in low, the CAQ method transmits higher resolution in the former areas. The original six-bit digitized video is converted to a three level signal by the quantizing circuit and then Huffman-encoded to exploit its statistical properties and reduce it further to one-bit per pixel. These circuits operate on one line of the picture at a time, and can handle information at full video (10 MHz) rate. The compressed information when received on the ground is stored in coded form in a two-frame (500,000 bit) digital core memory.

MAJS: /*DATA COMPRESSION/*REMOTELY PILOTED VEHICLES/*SIGNAL ENCODING/*TRANSMISSION EFFICIENCY/*VIDEO COMMUNICATION

76A45494

UTTL: Functional and reliability requirements concerning RPV's from the point of view of traffic safety and military cost effectiveness

AUTH: A/KASCHUETZ, H.; B/KROGULL, B.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, Paper, 15 p. In German.

ABS: The employment of unmanned aircraft for military objectives provides a possibility to perform certain operations more efficiently or at lower cost than with alternate manned systems. However, the differences in the characteristics of unmanned and manned systems have to be taken into account in considering the implications of RPV operation on peace-time air-traffic conditions. Questions regarding the application of the regulations of the air law on RPV operation are discussed. A reliability analysis of RPV's is conducted and aspects of cost effectiveness are investigated.

MAJS: /*AIRCRAFT RELIABILITY/*AIRCRAFT SAFETY/*COST EFFECTIVENESS/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES

76A45493

UTTL: Sensor systems for target acquisition and the determination of target location. I, II

AUTH: A/MEYERHOFF, K.; B/SIEBECKER, H. K.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 16 p. In German.

ABS: A description is given of a television camera with novel characteristics for RPV experiments which is being developed by a company in West Germany. The camera makes use of a switching mechanism for the image amplifier component of the device to assure image sharpness in the case of camera motions. The camera can also be used in night operations. Another development reported are television cameras with CCD arrays which are especially suited for mini-RPVs. Attention is also given to tracker system developments for 'intelligent' sensor systems. A number of future developments are also examined, taking into account advanced optical systems, PbSnTe and PbSnSe detectors, reductions in detector element dimensions, and price reductions as a consequence of the use of integrated-circuit technology.

MAJS: /*MINITRACK SYSTEM/*OPTICAL TRACKING/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION/*TELEVISION CAMERAS/*TRACKING (POSITION)

76A45492

UTTL: Proposal for an air/ground-RPV system and prospects for future technological objectives

AUTH: A/MOEHRING, M.; B/SCHMIDTLEIN, H.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 33 p. In German.

ABS: Mission requirements and system characteristics for RPV applications are examined and the use of RPV's for

defense suppression missions is considered. The complexity of RPV design requirements depends on their intended employment. A stepwise introduction of RPV's in three stages is, therefore, proposed. The design of the first stage is based on a use of current technology. The range of applications of the RPV's of the first stage is, however, restricted. RPV's of the third stage would be suitable for a wide range of missions. But an implementation of their envisaged functional characteristics and capabilities would require the solution of certain technical problems on the basis of new technological developments. The capabilities of RPV's of the second stage lie between those of the first and the third stage. The characteristics of the three design alternatives are discussed.

MAJS: /*AIR DEFENSE/*AIR TO SURFACE MISSILES/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION/*WEAPON SYSTEMS

76A45491

UTTL: Interference-proof intelligence transmission and interference-proof distance measurement for RPV applications

AUTH: A/SEPP, H.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 18 p. In German.

ABS: A description is presented of an interference-proof communication method. The described method can also be used in interference-proof distance measurements. The new method is particularly suited for RPV applications. Its use is, however, not restricted to such applications. The considered approach is based on the use of a pseudo-noise-phase-shift-keying procedure. The position of RPV can be determined with the aid of distance measurements in relation to a number of points the location of which is known.

MAJS: /*AIRCRAFT COMMUNICATION/*DISTANCE MEASURING EQUIPMENT /*ELECTROMAGNETIC INTERFERENCE/*ELECTRONIC COUNTERMEASURES/*REMOTELY PILOTED VEHICLES/*SIGNAL TRANSMISSION

76A45490

UTTL: Objective and status of the KEL program 'RPV key techniques'

AUTH: A/FRYEN, J.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 13 p. In German.

ABS: Targets for RPV missions are considered along with aspects of target recognition. A brief description of the objectives of parametric studies is presented. These objectives take into account performance factors in target acquisition in operations which include men, the sensor behavior in a high-speed low-altitude carrier system, and the reduction of transmission bandwidth for data transmission. A brief outline is given of the technological basis for the implementation of the considered objectives. The division of the experimental system in subsystems is discussed. Investigations which are needed are to be conducted with the aid of a flying laboratory.

MAJS: /*GROUND BASED CONTROL/*RADIO TELEMETRY/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION/*TRANSPONDER CONTROL GROUP

76A45489

UTTL: Existing RPV programs

AUTH: A/WEISS, H. J.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 21 p. In German.

ABS: The article surveys declassified material on remotely piloted vehicles and their functions, primarily Canadian and US developments. The West German CL89 reconnaissance drone is discussed. RPV system requirements and various RPV functions are reviewed: target designation, spotting and fire control, loiter time in target area, automatic operation, low radar profile, vulnerability to hostile counteraction, testing and maintenance. Retrievable and reusable RPVs, midair retrieval techniques, drogue and parachute landing, operation from road launchers or from ship decks, and high-flying standoff RPVs are discussed. The use of one-way one-shot RPVs for ECM missions or kamikaze strikes is also discussed.

MAJS: /*MILITARY AVIATION/*REMOTELY PILOTED VEHICLES

76A45488

UTTL: Means and procedures for obtaining an adequate survival probability in the case of RPV

AUTH: A/BEISENHERZ, H. J.; B/SCHLENKRICH, V.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 32 p. In German.

ABS: An investigation is conducted concerning the dangers and hazards to which an RPV is exposed during ground attack missions, taking into account approaches for enhancing the chances of RPV survival. RPV design concepts for implementing these approaches are consicered and the meaning of the term 'adequate survival probability' is discussed. Attention is given to tactical measures, including a flight close to the

ground, and to RPV design characteristics which will make the detection and tracking of the RPV by the enemy more difficult.
MAJS: /*AIRCRAFT DETECTION/*AIRCRAFT SURVIVABILITY/*ATTACK AIRCRAFT/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES

76A45487
UTTL: Application and employment of RPV's in Central Europe
AUTH: A/SPINTZYK, J.; B/HARMS, G.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Symposium on Remotely Piloted Vehicles, Porz-Wahn, West Germany, May 13, 1976, 44 p. In German.
ABS: The considered employment possibilities are related to air reconnaissance, attack missions, and air defense suppression. Mission and system concepts for the considered applications are discussed and the technological requirements are examined. A more detailed description is presented of RPV's for directing artillery fire and of RPV's for ground attack missions. An analysis is conducted of RPV-related objectives of the armed forces of West Germany, taking into account general problems of the defense of Central Europe and specific tasks of the army and the air force.
MAJS: /*AIR DEFENSE/*FIRE CONTROL/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

76A45414
UTTL: Prospective markets and design concepts for civilian remotely piloted aircraft
AUTH: A/NELMS, W. P., JR.; B/GREGORY, T. J.; C/ADERHOLD, J. R. CORP: Lockheed Missiles and Space Co., Sunnyvale, Calif.; National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Meeting, Dallas, Tex., Sept. 27-29, 1976, 10 p.
ABS: This paper summarizes a study that examines the technical, economic, and environmental aspects of remotely piloted vehicles (RPVs) in the civil environment. A market survey was conducted in which 35 civil applications of RPVs were identified. For a number of these uses, vehicle and system concepts were defined, benefit and cost comparisons were made with present methods, and the influence of safety and environmental implications was assessed. The results suggest a sizable potential demand for the use of RPVs in the civil sector, and some of the applications show promising cost savings over established methods. A focussed technology effort could provide the safety assurances needed for routine civilian operation of RPVs.
MAJS: /*AIRCRAFT DESIGN/*CIVIL AVIATION/*REMOTELY PILOTED VEHICLES/*USER REQUIREMENTS/*UTILITY AIRCRAFT

76A45393
UTTL: Automated optimization techniques for aircraft synthesis
AUTH: A/VANDERPLAATS, G. N. CORP: National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.
American Institute of Aeronautics and Astronautics, Aircraft Systems and Technology Meeting, Dallas, Tex., Sept. 27-29, 1976, 11 p.
ABS: Application of numerical optimization techniques to automated conceptual aircraft design is examined. These methods are shown to be a general and efficient way to obtain quantitative information for evaluating alternative new vehicle projects. Fully automated design is compared with traditional point design methods and time and resource requirements for automated design are given. The NASA Ames Research Center aircraft synthesis program (ACSYNT) is described with special attention to calculation of the weight of a vehicle to fly a specified mission. The ACSYNT procedures for automatically obtaining sensitivity of the design (aircraft weight, performance and cost) to various vehicle, mission, and material technology parameters are presented. Examples are used to demonstrate the efficient application of these techniques.
MAJS: /*AIRCRAFT DESIGN/*COMPUTERIZED DESIGN/*REMOTELY PILOTED VEHICLES

76A45371
UTTL: Investigation of the absolute stability of an elastic aircraft during flight on course
AUTH: A/CHIKHLADZE, T. M.
Akademiia Nauk Gruzinskoi SSR, Soobshchenila, vol. 82, May 1976, p. 445-447. In Russian.
ABS: The paper uses the Liapunov vector function method to examine the effect of the elastic properties of an automatically piloted aircraft on its flight on course. The dimension of the system of differential equations describing the motion of the aircraft is equal to infinite, and, during bending of the aircraft, there is an unlimited number of degrees of freedom in the form of elastic vibration modes. Each mode is represented as a second order differential equation.
MAJS: /*AIRCRAFT STABILITY/*ELASTIC BODIES/*FLIGHT CHARACTERISTICS/*REMOTELY PILOTED VEHICLES

76A44967
UTTL: M.T.F. analysis of R.P.V. sensor/display link
AUTH: A/PRATT, P. D.
In: Electro-optical Systems Design Conference and International Laser Exposition, Anaheim, Calif., November 11-13, 1975, Proceedings of the Technical Program. (A76-44926 23-35) Chicago, Industrial and Scientific Conference Management, Inc., 1975, p. 610-617.
ABS: It is noted that the design of a TV-compatible electrooptical system for a remotely piloted vehicle requires that the platform, data link, display, and sensor be included in a systems tradeoff analysis. A method is outlined which uses modulation transfer functions (MTFs) to allow a tradeoff analysis of all system components. The tradeoff is made between sensor field of view and component MTF or resolution; the general system requirement is that a target of known contrast and dimension be resolvable on a display with adequate contrast and probability of detection. The steps of the tradeoff analysis are outlined, and the component MTFs are examined. Maximum viewing distances for detection and recognition of a target against a road and a field are computed for a nine-inch display.
MAJS: /*DATA LINKS/*ELECTRO-OPTICS/*MODULATION TRANSFER FUNCTION/*REMOTELY PILOTED VEHICLES/*SYSTEMS ANALYSIS /*TARGET RECOGNITION

76A42044
UTTL: Multibeam adaptive array for RPV antijam communication
AUTH: A/NOJI, T. T.; B/SCHWARTZ, L.
In: International Telemetering Conference, Washington, D.C., October 14-16, 1975, Proceedings. (A76-42801 21-32) Pittsburgh, Pa., Instrument Society of America, 1975, p. 636-649.
ABS: An application using a multibeam adaptive array for the simultaneous communications of command control along with telemetry data from 20 remotely piloted vehicles (RPVs) to a command station is studied. It is assumed that the RPVs are on tactical mission beyond the forward edge of the battle area and that communication links must be established to and from each RPV in the presence of many airborne and/or surface-based jammers, with the data link being operated at C-band. The concept evaluated employs an airborne array but locates all of the complex beam forming and adaptive antijam processor functions for each RPV on the ground, hence its name Adaptive Ground Implemented Phase Array or AGIPA. Although a tethered rotor vehicle is considered for the relay platform, the basic multibeam antijam concept is applicable whether the array is remotely suspended in space or surface-based. The system approach for multibeam adaptive arrays using the AGIPA concept is discussed in detail.
MAJS: /*ELECTRONIC COUNTERMEASURES/*JAMMERS/*MULTICHANNEL COMMUNICATION/*PHASED ARRAYS/*RADIO FREQUENCY INTERFERENCE/*REMOTELY PILOTED VEHICLES

76A42843
UTTL: Low data rates necessary for RPV command guidance
AUTH: A/MCINTYRE, G. W.; B/SPENCER, B. M.
In: International Telemetering Conference, Washington, D.C., October 14-16, 1975, Proceedings. (A76-42801 21-32) Pittsburgh, Pa., Instrument Society of America, 1975, p. 624-635.
ABS: In the design of a tactical multi-remotely piloted vehicle (RPV) data link, the RPV data rate and update rate are crucial to the multi-RPV scenario. Data rates on the order of 150 bits per second per RPV or fewer and update rates of fewer than 2 per second per RPV must be used if the RPVs are to operate successfully in a hostile jamming environment. This limit is imposed by the amount of RF spectrum that can be obtained for applying spread-spectrum to protect the data channel. Through data management all necessary RPV command and telemetry functions can be handled at these rates.
MAJS: /*AIRCRAFT COMMUNICATION/*COMMAND GUIDANCE/*DATA LINKS /*MILITARY AIRCRAFT/*PULSE COMMUNICATION/*REMOTELY PILOTED VEHICLES

76A42C86
UTTL: Simulation of a remotely piloted vehicle/drone control facility using SAINT
AUTH: A/WORTMAN, D. B.; B/DUKET, S. D.; C/SEIFERT, D. J.
In: Summer Computer Simulation Conference, San Francisco, Calif., July 21-23, 1975, Proceedings. Volume 1. (A76-42076 21-59) Montvale, N.J., AFIPS Press, 1975, p. 508-517.
ABS: Systems analysis of integrated networks of tasks referred to as SAINT provides the simulation concepts necessary to model man and machine in the face of environmental factors. A remotely piloted vehicle/drone control facility (RPV/DCF) is designed to simulate, in a real-time environment, a mission consisting of a group of RPVs flying to a target and returning to home base. The paper discusses both the SAINT modeling and simulation technique and the SAINT model of the RPV/DCF. Decomposing an overall system into its components and then providing a vehicle to integrate the components into system performance measures is in the true spirit of the systems approach to problem solving. SAINT is shown to be a powerful tool in the modeling and analysis of complex systems.

MAJS: /*COMPUTERIZED SIMULATION/*DRONE VEHICLES/*MAN MACHINE SYSTEMS/*REAL TIME OPERATION/*REMOTELY PILOTED VEHICLES

76A41975
UTTL: The challenge of tactical RPV command and control
AUTH: A/COMFORT, G. C.; B/BONGIOVI, R. P.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976, Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 3 p.
ABS: Factors affecting the design and development of Remotely Piloted Vehicle (RPV) systems are discussed. Particular attention is given to the requirements for command and control as reflected in the RPV Mission Control System (RMCS), which is being coordinated with the DCM-34C, Compass Cope, and Advanced RPV (ARPV) programs. The RPV RMCS will serve to integrate these elements into a system responsive to the Tactical Air Control System, and will extend beyond the status monitoring/data recording function to include more extensive commands, information dissemination in near real time, and potentially a positioning capability. The program will increase RPV system flexibility and adaptability by replacing the current command capability with a simultaneous command capability which could support mission achievement across a broader spectrum of vehicle performance. Automated procedures will be developed to rapidly program RPVs prior to launch and may include mission reprogramming up to and including real time. User needs will be translated into mission profiles and a real time link will be available between the vehicle on its mission and the theater commander
MAJS: /*AIRCRAFT DESIGN/*COMMAND AND CONTROL/*REMOTELY PILOTED VEHICLES/*SYSTEMS ENGINEERING

76A41974
UTTL: The users experience with operational RPVs
AUTH: A/RUPPENTHAL, F. E.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976, Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 4 p.
ABS: The Strategic Air Command's (SAC) Operational Remotely Piloted Vehicle (RPV) program is described, with emphasis on the problems encountered that have had an adverse effect upon the operational employment of RPV systems. A brief review is given of SAC's operational concept and the equipment used for the past decade to accomplish these missions. Ideas on the technical innovations necessary to alleviate problem areas associated with the employment of RPVs are discussed. Subjects covered include command and control equipment, RPV recovery, training, and RPV design.
MAJS: /*MILITARY AIRCRAFT/*OPERATIONAL PROBLEMS/*REMOTELY PILOTED VEHICLES

76A41973
UTTL: The future role of RPVs in TACAIR
AUTH: A/BURKLEY, G. W.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976, Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 5 p.
ABS: The role of tactical aircraft (TACAIR) in modern warfare is examined to identify windows of opportunity in the Department of Defense budget for the procurement of Remotely Piloted Vehicles (RPV). The inventory projections for early warning and control, reconnaissance, electronic warfare, air-to-air capability, direct air support, and all-weather interdiction are examined, and the ability of RPVs to serve a useful function in these areas is considered. Two opportune times for the introduction of TACAIR systems, including RPVs, are identified: 1978-1984 and after 2010.
MAJS: /*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TECHNOLOGICAL FORECASTING

76A41972
UTTL: Design for attrition
AUTH: A/KLOSTERMAN, W. E.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976, Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 8 p.
ABS: An analytical technique which allows comparison of the capabilities of widely differing weapon systems in an attrition environment is used to investigate the design criteria for Remotely Piloted Vehicles. It is shown that in a severe attrition environment, small strike vehicles are more effective. The criteria used to evaluate the effectiveness of strike vehicles stress resources expended to obtain the de
MAJS: /*AIR DEFENSE/*AIRCRAFT DESIGN/*MILITARY AIRCRAFT/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

76A41971
UTTL: The role of propulsion in effecting low cost RPV operations
AUTH: A/BURGE, H. L.; B/HARDGROVE, J. A.; C/STEPHENS, W.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 19[illegible] Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 22 p.
ABS: To achieve low cost RPV operation requires design principles which result in across-the-board cost effectiveness. This paper deals with two aspects of propulsion design cost effectiveness: launch propulsion and sustaining flight propulsion. In the case of the expendable vehicle the overall system must incorporate principles which are compatible with the expendable munitions round approach. To achieve maximum cost effectiveness in massive sortie deployment while maintaining high mobility levels requires a low cost launching concept. The jet tab thrust vector controlled booster motor is examined for the low cost launching propulsion. The pulse jet is examined as a viable sustainer engine concept for the expendable vehicle.
MAJS: /*COST EFFECTIVENESS/*PROPULSION SYSTEM CONFIGURATIONS /*REMOTELY PILOTED VEHICLES

76A41970
UTTL: Acceptable cost ratios for several RPV missions
AUTH: A/OBRIEN, D. J.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976. Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 7 p.
ABS: The cost-effectiveness of using Remotely Piloted Vehicles in different roles (surveillance, strike, tank army defense suppression) is compared with that of alternative vehicles or weapons. The RPVs offer significant savings in operation and maintenance costs and personnel for surveillance operations, and can reduce aircraft losses and release aircraft for other missions. They offer the advantage of operation at very low altitudes under virtually all weather conditions. If they are used to prepare the way for fighter bomber attacks, they can cause extensive damages to the enemy position while diverting defensive fire that would otherwise be directed to more costly aircraft.
MAJS: /*COST EFFECTIVENESS/*MILITARY AIRCRAFT/*MILITARY OPERATIONS/*REMOTELY PILOTED VEHICLES/*WARFARE

76A41968
UTTL: Civil uses of remotely piloted aircraft
AUTH: A/NELMS, W. P., JR.; B/ADERHOLD, J. R. CORP: National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
In: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976. Proceedings. (A76-41967 21-05) Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 9 p.
ABS: An overview of an ongoing stucy of civil applications of Remotely Piloted Vehicles (RPVs) is presented, including a summation of results to date and the status of work yet to be completed. The intent of the study is to examine the total technical, economic, and environmental impact of RPVs in the civil environment in order to identify and assess the technological effort required to bring these vehicles to realization. The paper describes a market survey in which some 35 civil applications of RPVs have been defined and categorized into groups which have similar mission requirements. From this broad analysis of many potential uses, a smaller number of promising and representative applications have been selected for more in-depth analysis. Using one or two of these applications as specific examples, the paper briefly describes system performance requirements and vehicle concepts, and compares the benefits and costs with those of present methods. The paper also reports on the status of other work such as subsystem concepts, assessment of the technology, and the influence of safety and environmental considerations on these future civil RPV systems.
MAJS: /*CIVIL AVIATION/*MARKET RESEARCH/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

76A41967
UTTL: National Association for Remotely Piloted Vehicles, Annual Symposium, 3rd, Dayton, Ohio, May 3-5, 1976. Proceedings
Dayton, Ohio, National Association for Remotely Piloted Vehicles, 1976. 78 p.
ABS: The papers cover a variety of industry suggested issues concerning the design and use of remotely piloted vehicles (RPVs) for civil and military applications. Topics include the role of propulsion in the cost effectiveness of RPVs; FAA regulations of RPV flights; civil uses of remotely piloted aircraft; aerial observations for environmental monitoring; and the users' experience with operational RPVs. Individual items are announced in this issue.
MAJS: /*CIVIL AVIATION/*CONFERENCES/*MILITARY TECHNOLOGY/* REMOTELY PILOTED VEHICLES

76A41451
UTTL: Mini-RPV flight dynamics measurements
AUTH: A/JARVINEN, P. O.; B/BRUCE, C. F.
In: Guidance and Control Conference, San Diego, Calif., August 16-18, 1976, Proceedings. (A76-41426 20-12) New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 207-214.
ARPA-Army-sponsored research.
ABS: Experimental measurements are presented of the flight dynamic motions of a representative Mini-RPV at altitudes below one kilometer in gusty air at Ft. Huachuca, Arizona. Delta-wing Mini-RPV airframe motions during open-loop and autopilot flight were measured with an on-board three-axis linear accelerometer/angular accelerometer package while atmospheric gustiness conditions were measured with a gust vane mounted on a boom forward of the aircraft. A 32-channel pulse amplitude modulation telemetry system transmitted the data from the Mini-RPV to the ground where it was recorded on magnetic tape and also displayed in real time. Significant data was obtained on vehicle response to gusty air and due to maneuver commands and a summary of the data is presented.
MAJS: /*AIRCRAFT STABILITY/*DYNAMIC RESPONSE/*FLIGHT CHARACTERISTICS/*FLIGHT STABILITY TESTS/*REMOTELY PILOTED VEHICLES

76A36907
UTTL: Remotely piloted research vehicle evaluation of advanced control system effects on spins
AUTH: A/PETERSEN, K. L. CORP: National Aeronautics and Space Administration, Flight Research Center, Edwards, Calif.
In: Atmospheric Flight Mechanics Conference, 3rd, Arlington, Tex., June 7-9, 1976, Proceedings. (A76-36901 17-08) New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 55-64.
ABS: Special functions of an advanced control system were investigated for effects on spin entries and recoveries utilizing a 3/8-scale model of the F-15 airplane as a remotely piloted research vehicle (RPRV). Telemetry uplinks and downlinks were used with a ground-based digital computer to mechanize the RPRV control system for spin tests in flight. Results from the model RPRV flight tests and from a real time digital spin simulation were used to evaluate the F-15 stall inhibiter and an automatic spin recovery system developed for the RPRV model
MAJS: /*AIRCRAFT CONTROL/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT/*SPIN TESTS

76A34309
UTTL: Linear array applications to remotely piloted vehicles
AUTH: A/SPOERRI, S.
Microwave Journal, vol. 19, June 1976, p. 31-34, 39.
ARPA-sponsored research.
ABS: The potential of an electronically scanned linear array for ground mapping and for detection and tracking of ground targets is surveyed, with emphasis on the selection of radar parameters. The coverage of an electronically scanned linear array in forward looking and side looking, the coherent Doppler spectrum for clutter discrimination, suitable data processing techniques, use of displaced phase center antennas and synthetic aperture radars, beam resolution, sensitivity, and electronic scanning techniques are discussed. Radar mapping and target tracking from remotely piloted vehicles can be used in geologic resources surveys, earth remote sensing (flood and fire control, crop surveys and pest control), monitoring of military activity (in treaty enforcement or hostile operations), ground traffic monitoring, and rescue operations.
MAJS: /*AIRCRAFT ANTENNAS/*LINEAR ARRAYS/*MICROWAVE ANTENNAS /*RADAR SCANNING/*REMOTELY PILOTED VEHICLES/* SIDE-LOOKING RADAR

76A34239
UTTL: Antiship cruise missile threat simulation utilizing a RPV
AUTH: A/GERRITY, R. J.; B/GEVAERT, G.
In: Toward more effective testing; Proceedings of the Sixth Annual Symposium, St. Louis, Mo., August 13-16, 1975. (A76-34233 16-05) Lancaster, Calif., Society of Flight Test Engineers, 1975, p. 89-107.
ABS: A digital/analog hybrid real time simulator system for simulating a cruise missile threat to ship targets in an open sea environment, in order to test antiship missile defense systems, is described, with testing equipment and test sequences. A TACAN guidance augmentation system (TGAS) is developed and flight-tested on a drone aircraft for RPV simulation of the attacking missile. The missile flight is executed with a surface or air launch beyond the horizon, and tracking of a programmed altitude/heading profile until a TACAN signal is intercepted. Two basic RPV profiles are specified for the drone: a straight-in descent profile and a steep descent profile (the pre-descent portions of the profiles are identical). Automatic backup mode switching and redundant abort functions add to mission success and safety. Flight control hardware and simulator system hardware are described and illustrated.
MAJS: /*AIRCRAFT GUIDANCE/*ANTIMISSILE DEFENSE/*COMPUTERIZED

SIMULATION/*MISSILE SIMULATORS/*REMOTELY PILOTED VEHICLES/*TACAN

76A32032
UTTL: The Boeing Compass Cope Program
AUTH: A/McPHERSON, R. L.
(Society of Experimental Test Pilots, Mini-Symposium, San Diego, Calif., Apr. 4-6, 1975.) Society of Experimental Test Pilots, Technical Review, vol. 13, no. 1, 1976, p. 48-55.
ABS: The Boeing Compass Cope Program is an RPV system where the pilot remotely flies the vehicle from the command module using standard aircraft instruments and controls. A modified AN/TPW-2 microwave command and guidance system provides air vehicle position tracking and data transmit and receive functions when the command module pilot is controlling the vehicle. A Loss of Carrier Program will automatically take over control of the vehicle if the command and control link is interrupted for more than 1.5 seconds on the ground or 5.0 seconds during flight. The flight testing and operation of two RPVs - XQM-93A and YQM-94A - are discussed.
MAJS: /*BOEING AIRCRAFT/*COMMAND AND CONTROL/*COMMAND GUIDANCE/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES

76A32243
UTTL: SAINT simulation of a remotely piloted vehicle/drone control facility
AUTH: A/WORTMAN, D. B.; B/DUKET, S. D.; C/SEIFERT, D. J.
In: Human factors in our expanding technology: Proceedings of the Nineteenth Annual Meeting, Dallas, Tex., October 14-16, 1975. (A76-32226 15-54) Santa Monica, Calif., Human Factors Society, 1975, p. 342-346.
ABS: SAINT is a modeling and simulation technique that provides the concepts necessary to model systems that contain tasks (discrete elements), state variables (continuous elements), and interactions between them. SAINT has been designed to facilitate the modeling and analysis of complex man-machine systems. This paper describes a SAINT network model of a real-time simulation of a drone control facility (DCF) in which operators monitor and control the flight of simulated remotely piloted vehicles (RPVs) through the use of visual (CRT) displays.
MAJS: /*COMPLEX SYSTEMS/*COMPUTERIZED SIMULATION/*FLIGHT CONTROL/*MAN MACHINE SYSTEMS/*REMOTELY PILOTED VEHICLES/*SYSTEMS ANALYSIS

76A30180
UTTL: Piloting-navigational visual television indicator
AUTH: A/KUPRIIANOV, S.; B/TSVETKOV, R.
Problemi na Tekhnicheskata Kibernetika, no. 1-2, 1975, p. 238-243. In Bulgarian.
ABS: The problem of designing a piloting-navigational visual television indicator in a remote control system for movable objects with a large number of degrees of freedom (for example, aircraft and submarine equipment) is considered. The operating block diagram of a visual pilot indicator giving a generalized image on the TV screen corresponding to the real-time spatial situation is shown. The modes of indication for heading, bank, pitch, height, and velocity are considered.
MAJS: /*DISPLAY DEVICES/*NAVIGATION AIDS/*REMOTE CONTROL/*REMOTELY PILOTED VEHICLES/*VISUAL AIDS

76A29494
UTTL: In flight simulation - A unique approach to flight testing an all-weather landing system
AUTH: A/HUBER, R. P.; B/REYNOLDS, P. A.
In: Visual and Motion Simulation Conference, Dayton, Ohio, April 26-28, 1976, Proceedings. (A76-29476 13-53) New York, American Institute of Aeronautics and Astronautics, Inc., 1976, p. 145-153.
ABS: A variable stability aircraft has been used as a test bed for the development and performance evaluation of an all-weather landing system for a remotely piloted vehicle (RPV). The advantages and limitations of using a variable stability aircraft for this application are discussed. The implementation of the RPV autoland system on the total in-flight simulator (TIFS) is outlined. Included are the techniques for and the problems associated with flight simulation to touchdown and throughout rollout. Typical performance data obtained in the flight simulation are presented.
MAJS: /*AIRCRAFT LANDING/*ALL-WEATHER LANDING SYSTEMS/*FLIGHT SIMULATION/*FLIGHT TESTS/*LANDING SIMULATION/*REMOTELY PILOTED VEHICLES

76A25721
UTTL: RPRV research focus on HIMAT
AUTH: A/LOCKENOUR, J. L.; B/LAYTON, G. P. CORP: Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.; National Aeronautics and Space Administration, Flight Research Center, Edwards, Calif.
Astronautics and Aeronautics, vol. 14, Apr. 1976, p. 36-41.
ABS: A review is presented of the F-15 Remotely Piloted Research Vehicle (RPRV) project. The F-15 RPRV is air-launched from a B-52 at 50,000 ft. Following

launch a series of research maneuvers are performed during an unpowered descent to a recovery altitude. Another RPRV program considered is the Highly Maneuverable Aircraft Technology (HiMAT) program. This program is designed to use RPRVs to speed the technology transition from wind tunnel to flight and to reduce the cost of aeronautical experiments. It is pointed out that HiMAT will make extensive use of composite materials.

MAJS: /*AIRCRAFT MANEUVERS/*F-15 AIRCRAFT/*REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT/*RESEARCH VEHICLES

76A24003

UTTL: Small format photography for mini-RPV

AUTH: A/ORLANDO, C.

In: Effective utilization and application of small-format camera systems: Proceedings of the Seminar, Anaheim, Calif., March 17, 18, 1975. (A76-24001 09-35) Palos Verdes Estates, Calif., Society of Photo-Optical Instrumentation Engineers, 1975, p. 15-20.

ABS: Studies have been carried out to develop a basic design concept for a camera system to be used with radio-guided drones in aerial surveillance missions. A panoramic camera concept making use of a 35-mm format was selected for further development. Flight tests and computer analyses indicate that a simple camera system with a single fast shutter speed of 1/2000 sec and a single high aperture setting of f/1.4 will provide acceptable photographs over a significant part of the day. An experimental developing formulation, POTA, makes it possible to overexpose a negative by 7 stops and still obtain usable imagery, eliminating the need for automatic aperture control.

MAJS: /*AERIAL PHOTOGRAPHY/*DRONE AIRCRAFT/*PANORAMIC CAMERAS/*REMOTELY PILOTED VEHICLES

76A22317

UTTL: Vertical attitude takeoff and landing remotely piloted demonstration vehicle

AUTH: A/EILERTSON, W. H.

Society of Automotive Engineers, National Aerospace Engineering and Manufacturing Meeting, Culver City, Calif., Nov. 17-20, 1975. 19 p.

ABS: The VATOL remotely piloted vehicle for demonstration purposes incorporates a delta wing, has its power plant located at the rear of the aircraft, and uses a close coupled canard to extend maximum lift. A single vertical tail is used for horizontal flight directional stability, and elevons on the wing and a rudder on the vertical tail are used for horizontal flight control. The Harpoon midcourse guidance unit serves as both an autopilot and an inertial navigator by means of an Attitude Reference Assembly in a strapdown inertial sensor configuration, a digital computer autopilot and a self-contained power supply. Experimental data on aerodynamic performance (trim lift vs trim drag, longitudinal stability, lateral stability), jet vane performance, velocity distribution, and exhaust flow conditions at lift-off are discussed. The results of engine installation tests are presented, together with the planning of future flight tests: tethered hover tests, horizontal flight tests, and ship interface tests.

MAJS: /*AIRCRAFT CARRIERS/*REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT/*VERTICAL TAKEOFF AIRCRAFT

76A22294

UTTL: Electronic fuel controls for missile and RPV gas turbines

AUTH: A/CROPPER, G. D.

Society of Automotive Engineers, National Aerospace Engineering and Manufacturing Meeting, Culver City, Calif., Nov. 17-20, 1975. 14 p.

ABS: Current gas turbine fuel controls for unmanned applications usually employ electronic computation controlling a basic fuel handling package. Several possible fuel handling systems are discussed, and examples of a simple target drone control and more complex cruise missile control are described in some detail. Finally, some comments are made on likely future trends in electronic computer design.

MAJS: /*ELECTRONIC CONTROL/*FUEL CONTROL/*GAS TURBINE ENGINES/*NUMERICAL CONTROL/*REMOTELY PILOTED VEHICLES /*ROCKET ENGINE CONTROL

76A19424

UTTL: Applied software engineering - A real-time simulator case history

AUTH: A/MCCAMMON, S. R.

IEEE Transactions on Software Engineering, vol. SE-1, Dec. 1975, p. 377-383.

ABS: The paper describes the development of the data-processing subsystem for an interactive closed-loop real-time simulator of a command and control system for remotely piloted vehicles. The software engineering tools used in this project are discussed in detail, including the program generation center, the system and software teams, and the use of modular top-down programming. The code-generation procedure is outlined along with rules for the implementation of structured program. It is shown that a programmer productivity of 24 source-code lines per day was achieved on this job.

MAJS: /*CASE HISTORIES/*COMMAND AND CONTROL/*COMPUTER PROGRAMMING/*CONTROL SIMULATION/*REAL TIME OPERATION/* REMOTELY PILOTED VEHICLES

76A18289
UTTL: RPV - Perspectives of a military application
AUTH: A/HEILMANN, K.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Jahrestagung, 8th, Bonn, West Germany, Sept. 16-18, 1975, 45 p. In German.
ABS: Remotely piloted vehicles (RPV) are unmanned flight vehicles which are suited for a number of military uses. Such uses include missions with a great risk factor. Considered RPV missions are related to reconnaissance, air attack, and electronic warfare. Employment possibilities for RPV depend on a number of vital techniques involving interference-free data transmission and target recognition. An important factor is also the incorporation of RPV systems into existing military structures. A description of various types of RPV is presented.
MAJS: /*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES/* UNMANNED SPACECRAFT/*WEAPON SYSTEMS

76A17051
UTTL: Free flight tests with remote-controlled models of reentry vehicles
AUTH: A/RUNNE, K.
Raumfahrtforschung, vol. 19, Nov.-Dec. 1975, p. 308-313. In German.
ABS: Free-flight tests with remotely controlled models of reentry vehicles have been performed in order to investigate their low speed and landing characteristics. Remote controlling was not performed by visual contact but by telemetry emitter and receiver, process calculator and a flight instrument panel in the ground-based control station. The free-flight model was launched at an altitude of 28,000 ft on the NAMFI-range near the island Crete from a military transport aircraft. The original flight program had to be drastically reduced by unforeseen difficulties bound to local circumstances on the test range. Nevertheless good results have been obtained by the identification and extraction of the dependence of the lift coefficient, the drag coefficient and the pitch moment coefficient of the angle of attack. These results are compared with those obtained by theoretical investigations and by wind tunnel tests. Some data about the dynamic behavior have also been obtained.
MAJS: /*FLIGHT TESTS/*FREE FLIGHT/*REENTRY VEHICLES/* REMOTELY PILOTED VEHICLES/*SPACECRAFT MODELS

76A14977
UTTL: The reliability of flight vehicles
AUTH: A/VOLKOV, L. I.; B/SHISHKEVICH, A. M.
Moscow, Izdatel'stvo Vysshaia Shkola, 1975, 296 p. In Russian.
ABS: The book treats various aspects of the reliability of unpiloted, automatically controlled flight vehicles. Topics discussed include engineering methods for calculating reliability at the design stage, the structural reliability of flight vehicles, the reliability of the onboard electronic and navigation systems, reliability in relation to the final finishing of systems and structures, and methods for optimizing the reliability design.
MAJS: /*COMPONENT RELIABILITY/*PROBABILITY THEORY/* RELIABILITY ANALYSIS/*REMOTELY PILOTED VEHICLES/* SPACECRAFT DESIGN

76A14E03
UTTL: Remotely piloted vehicle/vertical attitude take-off and landing demonstration vehicle
AUTH: A/EILERTSON, W. H.
In: American Helicopter Society, Annual National Forum, 31st, Washington, D.C., May 13-15, 1975, Proceedings. (A76-14565 04-05) New York, American Helicopter Society, Inc., 1975. 13 p.
ABS: Launch and recovery of RPVs aboard ship has been identified by the Navy as a major design impact area. Vertical attitude take-off and landing offers attractive advantages to the Navy in that ship/RPV interface problems are alleviated. A 560-lb demonstration vehicle has been designed and constructed to test these advantages. This vehicle during 1975 will be flight tested to assess vertical hover capability of the RPV in the turbulent aerodynamic wake generated by a ships superstructure while underway. The design incorporates a close coupled canard/delta wing configuration. Components from the MQM74A target drone as well as the Harpoon missile are utilized. Other Navy laboratories are cooperating in support of engine installation design and test (NWC), guidance and control (NUSC), power circuitry (NATC), and flight tests (PMR/NWC). Flight tests in hover, horizontal flight, transition (at safe altitudes) and ship docking are planned.
MAJS: /*AIRCRAFT LANDING/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES/*VERTICAL TAKEOFF AIRCRAFT

76A13180
UTTL: Parachute deployment process evaluation using a simple dynamic testing technique
AUTH: A/SPEELMAN, R. J., III
American Institute of Aeronautics and Astronautics, Aerodynamic Deceleration Systems Conference, 5th, Albuquerque, N. Mex., Nov. 17-19, 1975, 10 p.
ABS: A simple and inexpensive testing technique exists for conducting detailed evaluation of a recovery system deployment process occurring under dynamic conditions. Benefits and limitations of the technique as well as some of the detail observations obtained in its application to preflight evaluation of a new RPV recovery system are described. Application of the technique identified deployment problems not normally detected through bench tear down examinations, yet typical of those detected through flight testing. Flight tests of the corrected system configuration revealed no additional problems. The technique in essence simply involves connecting the main riser of the packed parachute to an immovable object through use of a long cable, accelerating the pack to a predetermined velocity and as the cable draws tight to deploy the parachute, initiate high speed cameras to record the deployment for subsequent detailed evaluation.
MAJS: /*DEPLOYMENT/*DYNAMIC TESTS/*PARACHUTE DESCENT/*RECOVERY PARACHUTES/*REMOTELY PILOTED VEHICLES

75A45881
UTTL: An analytical model for the control of low flying aircraft and vehicles by visual cues
AUTH: A/GRUNWALD, A.
International Astronautical Federation, International Astronautical Congress, 26th, Lisbon, Portugal, Sept. 21-27, 1975, 38 p.
ABS: This paper represents the development and experimental validation of an analytical model for manual visual field control (VFC) of aircraft. A basic model for the control oriented visual field information (VFI) is proposed and formulated in an optimal control framework. A special case of VFC is studied, namely, the manual lateral control of a TV-guided remotely piloted vehicle (RPV) along a straight reference trajectory in the presence of side gusts. For experimental validation, a five-degree-of-freedom fixed-base simulator has been constructed to simulate a RPV flight along a nominally straight reference trajectory.
MAJS: /*AIRCRAFT CONTROL/*MATHEMATICAL MODELS/*OPTIMAL CONTROL/*REMOTELY PILOTED VEHICLES/*TERRAIN FOLLOWING AIRCRAFT/*VISUAL CONTROL

75A45C14
UTTL: Electronic warfare - Military needs propel mini-RPVs into tactical flight tests
AUTH: A/DAVIS, R. T.
Microwaves, vol. 14, Sept. 1975, p. 34-36, 38-41.
ABS: Various new flight-tested mini-RPV prototypes are illustrated and explained. They range from 45 to 150 pounds in weight with engines of 2-14 horsepower, and most contain a TV camera and laser relay beam for homing in on targets by large bombing aircraft. Other possible payloads include radar jammers, simple decoys, and kamikazi warheads. The vehicles can be controlled directly from ground stations or through links with larger aircraft.
MAJS: /*AUTOMATIC PILOTS/*ELECTRONIC CONTROL/*FLIGHT TESTS/*MILITARY TECHNOLOGY/*MINIATURIZATION/*REMOTELY PILOTED VEHICLES

75A42323
UTTL: RPV command and control
AUTH: A/FEDERMEN, H. M.
(Armed Forces Communications and Electronics Association, Annual Convention, 29th, Washington, D.C., June 3-5, 1975.) Signal, vol. 29, Aug. 1975, p. 64-67.
ABS: The construction and testing of several prototypes has shown that the mini-RPV concept involving the use of lightweight remotely piloted vehicles for military reconnaissance, surveillance, and target acquisition applications is viable. Problems which have to be solved are related to the data links, including the control link from the ground station to the RPV, the telemetry link that reports RPV status, and the video downlink if one is used. A combination of techniques is to be used to provide satisfactory data links. The techniques make use of spread spectrum modulation, adaptive array antennas, and video bandwidth compression.
MAJS: /*COMMAND AND CONTROL/*DATA LINKS/*MILITARY AIRCRAFT/*RADIO TELEMETRY/*REMOTELY PILOTED VEHICLES

75A41683
UTTL: Automatic control of drones and RPV's in formation
AUTH: A/LEE, W. H., JR.; B/RICHARDSON, L. T.
American Institute of Aeronautics and Astronautics, Guidance and Control Conference, Boston, Mass., Aug. 20-22, 1975, 8 p.
ABS: A system for automatic formation control of target vehicles has been developed and successfully demonstrated by flight testing. The system, which was designed for navigation, guidance, and control of up to six vehicles simultaneously, employs distance

measuring equipment (DME) for tracking/navigation. Simulation was employed extensively to minimize risks and reduce flight testing time. The system and the tools used in its development and evaluation are described. Also presented are results of flight tests of two MQM-34D target vehicles guided along precise flight paths in closely spaced formation.

MAJS: /*AUTOMATIC FLIGHT CONTROL/*COMMAND GUIDANCE/* COMPUTERIZED SIMULATION/*DIGITAL NAVIGATION/*REMOTELY PILOTED VEHICLES/*TARGET DRONE AIRCRAFT

75A41082

UTTL: Optimal design of a Mini-RPV lateral autopilot

AUTH: A/BAR-ITZHACK, I. Y.; B/FERDMAN, E.
American Institute of Aeronautics and Astronautics, Guidance and Control Conference, Boston, Mass., Aug. 20-22, 1975. 10 p.

ABS: In this paper the design of a lateral autopilot for a miniature remotely piloted vehicle (RPV) is described. The structure of the autopilot is predetermined, as well as the measured variables. Even though aileron alone is used to control the RPV, the system is completely controllable. Using several indices of performance the best autopilot gains are determined by minimizing these indices. The minimization is carried out in the complex plane and comparison is made with state space methods. When a single error, such as heading error, is considered, the complex plane minimization procedure is superior. The RPV poles due to the Dutch roll mode stay close to the imaginary axis, although heavy penalty is imposed by the performance index on a persisting error. The pole placement is restricted by the fact that the trace of the system matrix is constant. Although no rudder is used, the vehicle executes coordinated turns due to its natural coordination quality.

MAJS: /*AUTOMATIC PILOTS/*DESIGN ANALYSIS/*LATERAL CONTROL/* OPTIMIZATION/*REMOTELY PILOTED VEHICLES

75A37697

UTTL: Imaging systems for RPV's

AUTH: A/MEACHAM, J. H.
In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. (A75-37623 18-01) New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 576-582.

ABS: Emerging RPV systems place new emphasis on the need for small, low power, imaging systems which fulfill the requirements of navigation and recovery, as well as target acquisition, identification, and designation. Design approaches are discussed which led to the development of a modular family of day/night imaging systems. Flight test data is used to support the selection of an appropriate system for a particular scenario. Areas covered include special signal processing techniques, sensor trade-offs, and solid state imaging systems.

MAJS: /*AVIONICS/*IMAGE MOTION COMPENSATION/*IMAGING TECHNIQUES/*REMOTELY PILOTED VEHICLES

75A37669

UTTL: RPV Simulation/Evaluation Program /RSEP/

AUTH: A/STOVALL, J. P.
In: NAECON '75; Proceedings of the National Aerospace and Electronics Conference, Dayton, Ohio, June 10-12, 1975. (A75-37623 18-01) New York, Institute of Electrical and Electronics Engineers, Inc., 1975, p. 384-392.

ABS: RSEP is two-part digital computer program which simulates the flight of RPV's engaged in a strike mission and evaluates the contribution of a candidate set of avionics to mission success. The principal avionics functions that are modeled in the simulation are navigation, communications, target acquisition and tracking and weapon launch. The evaluation portion of the program uses data from the simulation along with a realistic logic to account for the interrelationships among mission events in order to develop a set of overall measures of avionic system effectiveness. In the course of exercising RSEP for a number of candidate systems, it has been found to be a flexible tool for conducting tradeoffs and identifying preferred systems and techniques.

MAJS: /*AIRCRAFT INSTRUMENTS/*AVIONICS/*COMPUTER PROGRAMS/* DIGITAL SIMULATION/*FLIGHT SIMULATION/*REMOTELY PILOTED VEHICLES

75A37C02

UTTL: HASPA design and flight test objectives

AUTH: A/PETRONE, F. J.; B/WESSEL, P. R.
American Institute of Aeronautics and Astronautics, Lighter Than Air Technology Conference, Snowmass, Colo., July 15-17, 1975. 12 p. Navy-supported research.

ABS: In the early Fall of 1975 the first of four scheduled flights to be conducted in the High Altitude Superpressured Powered Aerostat (HASPA) Program will take place. The vehicle is a remotely piloted airship of some 800,000 cubic feet volume which will operate at an altitude near 70,000 feet. This paper briefly describes the evolution of the concept and presents a general design overview. The propulsion system and the different power supplies to be used on the three

powered flights are described. The power supplies are primary Ag/Zn batteries, an H2/O2 fuel cell, and a solar array-secondary battery combination. These units are to provide both operating power and propulsion power for nominal periods of 30 hours, 7 days, and 30 days respectively. The flight test objectives and test measurement programs are described along with the launch, flight and recovery procedures. Most of the equipment being used in the test program has been designed to allow for maximum use of existing hardware which will minimize the program length and cost.

MAJS: /*AIRCRAFT DESIGN/*AIRSHIPS/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES

75A35261

UTTL: The age of the RPV data bus or the data bus comes of age

AUTH: A/PICO, L. C.
In: Automatic support systems for advanced maintainability; Symposium, San Diego, Calif., October 30-November 1, 1974, Conference Record. (A75-35251 16-01) New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 77-83.

ABS: The use of the airborne onboard processor to operate in a uniquely-controlled mode for self-validation, and subsequent validation of subsystems that are connected to a multiplexed digital data bus, are described. This multiplexed digital data bus concept permits avionics system evaluation without the need for several special test connectors interfacing at the interface unit, typical of the present computer test systems. This test concept eliminates the many measurement instruments traditionally used for this purpose. The processor instruction and priority schemes are used to individually address each RPV subsystem and conduct evaluations. Tests can be selectively structured to permit varying levels of test complexity.

MAJS: /*AIRBORNE/SPACEBORNE COMPUTERS/*AUTOMATIC TEST EQUIPMENT/*AVIONICS/*CHANNELS (DATA TRANSMISSION)/*MULTIPLEXING/*REMOTELY PILOTED VEHICLES

75A34725

UTTL: System concept and key problems concerning pilotless, remotely-controlled combat aircraft UKF

AUTH: A/SPINTZYK, J.; B/STARKE, P.
Deutsche Gesellschaft fuer Luft- und Raumfahrt, Jahrestagung, 7th, Kiel, West Germany, Sept. 17-19, 1974, 82 p. In German.

ABS: Pilotless, remotely-controlled flight vehicles show great promise for combat missions involving strongly defended ground targets. An employment of such unmanned aircraft is considered in the case of typical area targets in connection with the provision of air support and missions which have the objective to isolate the combat area. A description of the considered vehicle concept is given. Key problems are related to target recognition, data transmission, target search at the projection screen, flight control, and vehicle navigation. Attention is also given to an experimental system for the study of the various problem areas.

MAJS: /*AIRCRAFT DESIGN/*FIGHTER AIRCRAFT/*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES

75A32452

UTTL: On the way to tactical aircraft robotics

AUTH: A/BALLENBERGER, W. B.
Astronautics and Aeronautics, vol. 13, June 1975, p. 26-35.

ABS: A radar control system for the F-102A aircraft is described. The PQM-102 target system, as it is designated, features a dual redundant (two sets of radar and controls) mobile ground station, a fixed ground station, and two fixed ground radar sources. The primary radar of the mobile ground station has a 50-n mi range and a 2-kW output; it controls the plane during takeoff and recovery and during close-in missions. The aircraft contains a 7.5-lb rod charge for destruct purposes and a scoring system consisting of four antenna assemblies containing two independent receiving elements, one horizontally and the other vertically polarized. Applications envisioned for the target system include interdiction, surveillance, reconnaissance, ECM, decoy, defense suppression, and air superiority.

MAJS: /*AIRCRAFT CONTROL/*F-102 AIRCRAFT/*GROUND BASED CONTROL/*REMOTELY PILOTED VEHICLES

75A26028

UTTL: Remotely piloted LTA vehicle for surveillance

AUTH: A/SEEMANN, G. R.; B/HARRIS, G. L.; C/BROWN, G. J.
In: Interagency Workshop on Lighter than Air Vehicles, Monterey, Calif., September 9-13, 1974, Proceedings. (A75-25969 10-05) Cambridge, Mass., MIT Flight Transportation Laboratory, 1975, p. 679-683.

ABS: The present work deals with the various aspects of a remotely piloted mini-LTA (lighter-than-air) vehicle for surveillance, monitoring and measurement in civilian and military applications. Applications, operations, and economics are discussed. A blimp design of about 5000 sq ft, 55 ft in length and 13 ft in diameter has been selected for the remotely piloted vehicle (RPV). Advantages of the LTA vehicle

over current HTA craft include endurance, good top speed, low pollution, no minimum speed, low vibration levels, low maintenance, stable platform, safety to ground personnel and property, flexibility (versatility), economy, low operator skill requirements, low radar cross-section, and ease of launch and recovery.

MAJS: /*AERIAL RECONNAISSANCE/*AIRSHIPS/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

75A25778

UTTL: A preliminary investigation of remotely piloted vehicles for airframe noise research

AUTH: A/FRATELLO, D. J.; B/SHEARIN, J. G.
American Institute of Aeronautics and Astronautics, Aero-Acoustics Conference, 2nd, Hampton, Va., Mar. 24-26, 1975. 7 p.

ABS: Aircraft noise encountered in the community is caused predominantly by the aircraft engines. However, expected advances in engine noise technology combined with recent experimental evidence indicate that airframe (nonpropulsive) noise may be a significant aircraft noise component in the future. Thus, methods for research into control of this type of noise are being evaluated and a technique based on the remotely piloted vehicle (RPV) concept appears to overcome some of the difficulties encountered with other test techniques. In particular, this paper presents sample experimental data, gathered during a preliminary RPV experiment, which illustrate the high signal-to-noise ratio attainable with this technique. Further, since the data are recorded as transients or nonstationary signals, a method of measurement and analysis is presented which increases statistical confidence in the results

MAJS: /*AIRCRAFT NOISE/*AIRFRAMES/*FULL SCALE TESTS/*NOISE GENERATORS/*REMOTELY PILOTED VEHICLES

75A19712

UTTL: A manipulator system designed for Free-Flying Teleoperator Spacecraft

AUTH: A/TEWELL, J. R.; B/SPENCER, R. A.; C/LAZAR, J. J.
In: Human Factors Society, Annual Meeting, 18th, Huntsville, Ala., October 15-17, 1974. (A75-19676 07-54) Santa Monica, Calif., Human Factors Society, 1974, p. 493-497.

ABS: A preliminary design of a manipulator system, applicable to a Free-Flying Teleoperator Spacecraft operating in conjunction with the Shuttle or Tug, is presented. The manipulator arm incorporates two 4-ft segments to the wrist with actuators located at the shoulder, elbow, and wrist. The wrist provides three degrees-of-freedom through pitch, yaw and continuous roll joints. An interchangeable end effector provides multiple task performance and satellite worksite versatility. A tip force of 10 lbs and a torque of 15 ft-lbs is provided. Man-in-the-loop simulations, using both unilateral and bilateral control techniques, were conducted. Based upon the simulation, a new, but relatively simple, control technique was proposed for the manipulator system.

MAJS: /*MANIPULATORS/*REMOTELY PILOTED VEHICLES/*SPACE MAINTENANCE/*TELEOPERATORS

75A19580

UTTL: Target acquisition in remotely piloted vehicles

AUTH: A/SPINTZYK, J.; B/STARKE, P.
Dornier-Post (English Edition), no. 3-4, 1974, p. 28-31.

ABS: Results of RPV missions flown against previously reconnoitred targets are discussed in re visual detection range, angular resolution, image aperture, target acquisition and engagement, and control station. Visual detection range fell off with darkness or poor target contrast; targets were recognizable with angular resolutions of 0.2 to 0.3 mrad/line; the smallest possible horizontal image aperture was the most efficient; a combination image sensor system working in two spectral ranges was the most promising solution to the target acquisition and engagement problem; and the control station design featured RPV controlled by one man (the pilot).

MAJS: /*AERIAL RECONNAISSANCE/*MILITARY TECHNOLOGY/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION

75A15710

UTTL: Chirping RPV data links for ECM protection

AUTH: A/OTTO, J.
Microwaves, vol. 13, Dec. 1974, p. 54, 56, 58, 60.
USAF-ARPA-sponsored research.

ABS: A review is presented of the signal processing involved in a chirp modem for transmitting and receiving digital data for an RPV command link. SAW devices would have to be up and down converted to microwave frequencies if used for RPV communications. Signal processing with reflective-array compressors is considered along with the chirp modulator, jamming problems, and the prototype links developed.

MAJS: /*CHIRP SIGNALS/*DATA LINKS/*ELECTRONIC COUNTERMEASURES/*MODEMS/*REMOTELY PILOTED VEHICLES

75A11724
UTTL: An inexpensive jet engine, dream or reality
AUTH: A/FAURY, MR.
L'Aeronautique et l'Astronautique, no. 47, 1974, p. 82-84. In French.
ABS: Discussion of the development of an expendable, short-lived jet engine of utmost design simplicity and suitable for mass production by processes of moderate tooling requirements, intended for the propulsion of remotely piloted vehicles for ground or sea attack, reconnaissance, illumination, decoy, interference, and target practice missions. A brief description of the French TRI 60 jet engine is presented.
MAJS: /*AIRCRAFT ENGINES/*COST EFFECTIVENESS/*ENGINE DESIGN /*REMOTELY PILOTED VEHICLES/*TURBOJET ENGINES

75A10623
UTTL: Mini-RPV's for cheap and no risk air power
AUTH: A/DAVIS, R. T.
MicroWaves, vol. 13, Oct. 1974, p. 40-42, 44, 46-48.
ABS: Evaluated is low-cost technology to be used in mini-RPV aircraft with special attention given to reconnaissance and surveillance missions. Different video-compression techniques are described from the standpoint of frame-rate reduction, resolution reduction, and image transformation. The Advanced Research Projects Agency (ARPA) is evaluating three spread-spectrum techniques including direct sequence pseudo-noise, frequency hop, and chirp radar communications. A table summarizes the anti-jam margins that are possible by each spread-spectrum method. The building of a mini-RPV with C-band command and data links, called the Mark II and intended for army battle field support, is discussed. Present program efforts aim to develop propulsion units that will meet with military standards, secure up/down links, and a multiple RPV control system.
MAJS: /*ATTACK AIRCRAFT/*COST EFFECTIVENESS/*MILITARY TECHNOLOGY/*RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES

75A10186
UTTL: Drone/RPV systems
AUTH: A/HEMENWAY, W. W.
Aeronautical Journal, vol. 78, Aug. 1974, p. 355-362.
ABS: Consideration of the Remotely Piloted Vehicle (RPV) as a low cost system with applications in diverse roles of aerospace tactics. Special attention is given to the application of the RPV to aerospace power and system elements, and to the research and development activity currently underway. The drone/RPV design is discussed from the point of view of a total weapon system, with the control guidance as an essential element reviewed in detail. Additional programs and applications are Weather/Atmospheric Sampling, the Low Altitude Multi-Purpose Drone (LAMP), the Mini-Drone, and Drone Control and Data Retrieval System (DCDRS).
MAJS: /*AIRCRAFT DESIGN/*DRONE AIRCRAFT/*MILITARY AIRCRAFT/* REMOTELY PILOTED VEHICLES/*TECHNOLOGY ASSESSMENT

74A45209
UTTL: RPV potential for naval applications
AUTH: A/BRYAN, C. V.; B/PENNINGTON, J. H.
Astronautics and Aeronautics, vol. 12, Oct. 1974, p. 58-63.
ABS: Prime objectives for the employment of RPVs in naval warfare include tactical reconnaissance, open-ocean surveillance, antisubmarine warfare, strike support, airborne early warning, and command and control. However, some challenging problems remain to be solved before RPVs can play a vital role in sea control and projection of naval forces. A number of the technical and operational risk areas are considered, giving attention to data links, questions of target acquisition and identification, launch and recovery problems, the establishment of a shipboard control station, questions of maintainability and reliability, and aspects of airspace control.
MAJS: /*ANTISUBMARINE WARFARE/*COMMAND AND CONTROL/* RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES

74A45208
UTTL: Air Force concepts for RPV application
AUTH: A/PALMER, J. A.
Astronautics and Aeronautics, vol. 12, Oct. 1974, p. 52-56.
ABS: The RPVs are to complement the manned force and to increase its effectiveness. RPVs can, thus, provide escort jamming of enemy radars in support of a strike penetration. An RPV remotely controlled by a man can be used to conduct an important mission in a highly defenced or politically sensitive area. Operational vehicles presently available possess a demonstrated ability to provide low- and high-altitude photo reconnaissance and signal intelligence in high-threat and/or poor-weather conditions. New uses of RPVs being considered include the relay of control signals and an employment as a wide-bank data link for transmitting images from TV or other sensors. High-altitude, long-endurance vehicles could provide continuous surveillance of ocean or land areas. Low-altitude mini-RPV could be used for real-time reconnaissance in a local battle area.
MAJS: /*COST EFFECTIVENESS/*ELECTRONIC COUNTERMEASURES/*

RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES/*
TARGET ACQUISITION

74A45307
UTTL: Remotely piloted vehicles for the Army
AUTH: A/GARBER, V.
Astronautics and Aeronautics, vol. 12, Oct. 1974, p. 46-51.
ABS: Early developments concerning remotely piloted vehicles (RPV) during the time from 1956 to 1967 are briefly examined. After a short period of inactivity in this field the investigations concerning the development of RPVs were resumed following a study of the Defense Science Board in 1971. The group conducting the study recommended the development of an RPV for performing surveillance and target-acquisition missions within the range of conventional artillery. Another mission recommended involved the use of a miniature aircraft or slow-burning rocket in a 'Kamikaze' role to attack forward-element point targets of high value. Potential RPV applications were reviewed in the fall of 1973. Details and results of the various RPV-related studies conducted are presented, giving attention to the role of radar, automatic data processing, data links, symbolic displays, and radar cross section reduction.
MAJS: /*DRONE AIRCRAFT/*RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION

74A43603
UTTL: NASA Flight Research Center scale F-15 remotely piloted research vehicle program
AUTH: A/LAYTON, G. P.
In: Advancements in flight test engineering; Proceedings of the Fifth Annual Symposium, Anaheim, Calif., August 7-9, 1974. (A74-43601 22-02) Lancaster, Calif., Society of Flight Test Engineers, 1974, p. 1-63 to 1-76.
ABS: The NASA Flight Research Center undertook a remotely piloted research vehicle (RPRV) program with a 3/8-scale model of an F-15 aircraft to determine the usefulness of the RPRV testing technique in high-risk flight testing such as spin testing. The results of the first flights of the program are presented. The program has shown that the RPRV technique, including the use of a digital control system, is a viable method for obtaining flight research data. Also presented are some negative aspects that have been learned about the RPRV technique in terms of model size, command frequency, and launch technique.
MAJS: /*F-15 AIRCRAFT/*NASA PROGRAMS/*REMOTELY PILOTED VEHICLES/*RESEARCH AIRCRAFT

74A41662
UTTL: V/STOL demonstrator vehicle for ejector thrust augmentation technology
AUTH: A/BYRNES, J. M.; B/MURPHY, R. D.; C/BALL, R. F.; D/NAGARAJA, K. S.; E/HAMMOND, D. L.; F/LANGLEBEEN, E. A.; G/ENGLISH, R. B.
American Institute of Aeronautics and Astronautics, Aircraft Design, Flight Test and Operations Meeting, 6th, Los Angeles, Calif., Aug. 12-14, 1974, 14 p.
ABS: The objective of this effort was to design a vehicle for the inflight demonstration of an ejector thrust augmentation concept. The approach was a design arrangement and parametric study based on an off-the-shelf engine. The result is a small, remotely piloted vehicle (RPV) specifically designed as a V/STOL ejector concept. The size, or injection area ratio of the ejectors is an optimum 13.5, which produces a thrust augmentation ratio of 1.66, or a VTOL weight of 896 pounds. The ejector installation is fully vectorable from hover to a maximum speed of 227 knots, but its real payload potential is reflected by a 80 per cent overload capability with a 1000 foot STOL ground roll. At the VTOL weight, a 30+ gallon fuel payload gives a 100 minute endurance at sea level.
MAJS: /*AIRCRAFT DESIGN/*EJECTORS/*REMOTELY PILOTED VEHICLES /*THRUST AUGMENTATION/*V/STOL AIRCRAFT

74A40488
UTTL: Command and control challenge for RPVs
AUTH: A/COLEY, S. J.; B/FRANKLIN, C. E.; C/PRINS, D. W. S.
Astronautics and Aeronautics, vol. 12, Sept. 1974, p. 64-70.
ABS: Discussion of recent progressive developments and future trends in subsystem features of remotely piloted vehicles (RPVs). Subsystem advances for RPVs reflecting a broad base of technology in other military areas are revived, along with more general RPV developments. Special attention is given to such subsystems as 2-axis stabilized gimbal TVs, forward looking infrared radar with stabilized pointing mirrors, laser designators, RPV autopilots with sensors, 8000-word general-purpose computers, and onboard navigation aids. Areas of R&D inviting further efforts in the coming years are shown to incluce data processing, integration with command and control elements, and multisensor integration.
MAJS: /*AUTOMATIC PILOTS/*COMMAND AND CONTROL/*COMPUTER TECHNIQUES/*REMOTELY PILOTED VEHICLES/*TECHNOLOGICAL FORECASTING

74A40487
UTTL: The Mini-RPV: Big potential - Small cost
AUTH: A/KRESA, K.; B/KIRLIN, W. F.
Astronautics and Aeronautics, vol. 12, Sept. 1974, p. 48-62.
ABS: A large sample of representative accomplishments in the area of very small remotely piloted vehicles (Mini-RPVs) is reviewed, and the key considerations in their development and applications are discussed. Mini-RPVs are shown to offer endurance, stealth, punch, and large economies. Nowhere in the RPV family is the removal of man from the cockpit of such dramatic effect on size and weight reduction as in Mini-RPVs. In its basic form, a Mini-RPV includes in a gross weight of 20 to 140 lbs a sensor package weighing from 5 to 35 lbs, a data link sized to data rates and communications distances desired and generally weighing 1 to 5 lbs, some form of simple navigation and attitude control weighing less than 2 lbs, and an airframe, engine, and fuel making up the rest of the gross weight. The performance of these Mini-RPV systems spans penetration ranges from 10 to 150 nautical miles, with times on station from 1 to 3 hrs.
MAJS: /*COST EFFECTIVENESS/*MINIATURIZATION/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION/*WEIGHT ANALYSIS

74A40486
UTTL: RPVs - Exploring civilian applications
AUTH: A/GREGORY, T. J.; B/BAILEY, R. O.; C/NELMS, W. P.
Astronautics and Aeronautics, vol. 12, Sept. 1974, p. 38-47.
ABS: Discussion of the civilian application possibilities for remotely piloted vehicle (RPV) systems. Following a listing of all possible desert, coastal, forest, agricultural, and urban RPV missions, a thorough examination is presented of such possible RPV aircraft applications as those of forest-fire detection and mapping. Some of the major obstacles to such civilian missions are also reviewed.
MAJS: /*AIRBORNE EQUIPMENT/*MISSION PLANNING/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION

74A39665
UTTL: Null-steering array for RPV application
AUTH: A/RASSWEILER, G. G.; B/MARTIN, G. P.; C/PAYNE, L. M.; D/LEHMAN, D. F.
In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. (A74-39651 20-07) New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 10E-1 to 10E-6.
ABS: Construction and testing of an analog adaptive null-steering array are described. This technique provices effective EMI protection and is particularly useful prior to signal acquisition when strong interferences and a weak signal are present. Null steering has been demonstrated to a depth of 30-45 dB with breadboard equipment that is not yet optimum. Biased interference suppression is the operative technique. Interference initially 20-40 dB greater than a desired signal source is found to be suppressed by 20-40 dB so that the interference to signal ratio equals one at the array output; the dominant interference simply suppresses itself in the array. Signal maximization (main beam pointing) is also achieved. A three-element adaptive array is presented, adaptive algorithms for the array control are given, and typical desired and jamming signal patterns are illustrated. Design improvements to minimize drift and intermods have been incorporated, and miniaturization by integrated circuit technology is underway.
MAJS: /*ADAPTIVE CONTROL/*ANTENNA ARRAYS/*RADIO FREQUENCY INTERFERENCE/*REMOTELY PILOTED VEHICLES/*SIGNAL RECEPTION

74A39664
UTTL: Functional command/control considerations for ship-ceployable tactical remotely-piloted vehicle /RPV/
AUTH: A/WEHMAN, R. E.
In: International Conference on Communications, 10th, Minneapolis, Minn., June 17-19, 1974, Conference Record. (A74-39651 20-07) New York, Institute of Electrical and Electronics Engineers, Inc., 1974, p. 10B-1 to 10B-4.
ABS: Examination of the technical requirements for effective and secure command/control/communications data links to and from a proposed ship-deployable remotely-piloted vehicle adaptable for use in tactical reconnaissance and/or targeting missions. Particular emphasis is given to two critical areas demanding higher performance capability than that afforded by current operational systems: (1) line-of-sight navigational tracking for extended ranges up to 100 miles over water under constantly-changing sea conditions; and (2) electronic countermeasures security of up and down links.
MAJS: /*AERIAL RECONNAISSANCE/*COMMAND AND CONTROL/*DATA LINKS/*REMOTELY PILOTED VEHICLES/*TARGET ACQUISITION/*VIDEO DATA

74A34846
UTTL: Flight test evaluation of a low cost electrostatic autopilot
AUTH: A/WANDREY, C. D.; B/BERGSTROM, D. K.
In: Flight testing today - 1973; Proceedings of the Fourth National Symposium, Las Vegas, Nev., August 21-23, 1973. (A74-34837 16-02) California, Md., Society of Flight Test Engineers, 1973, 5 p.
ABS: The test and evaluation program described was conducted to gain insight into the concept of a simple RPV autopilot, and to obtain practical experience in its application. The test system is described and its theory is outlined. Particular attention is given to the solution of the major problems encountered in the program. Conclusions of recommendations derived from the test data are presented.
MAJS: /*AIRCRAFT INSTRUMENTS/*ATTITUDE INDICATORS/*AUTOMATIC PILOTS/*ELECTRIC FIELDS/*FLIGHT TESTS/*LOW COST/*REMOTELY PILOTED VEHICLES

74A30598
UTTL: Experimental system for future remotely piloted vehicles
AUTH: A/SPINTZYK, J.
Dornier-Post (English Edition), no. 2, 1974, p. 22-25.
ABS: Unmanned remote-controlled combat aircraft, known as remotely piloted vehicles or RPVs, may well acquire great importance, alongside the conventional manned aircraft. The German armed forces could save upkeep costs in peacetime with the aid of RPVs. Defence capability would not suffer thereby, since RPVs promise greater efficiency in operation. An especially interesting aspect is the use of RPVs against attacking armored units and other strongly defended ground targets in the combat area. The RPV system envisaged by Dornier consists of one or more vehicles, a flying relay station, and a mobile ground control station.
MAJS: /*ATTACK AIRCRAFT/*AUTOMATIC PILOTS/*GROUND BASED CONTROL/*REMOTELY PILOTED VEHICLES

74A27849
UTTL: Stratospheric survey aircraft developed
Aviation Week and Space Technology, vol. 100, Apr. 15, 1974, p. 62, 63, 65.
ABS: A remotely piloted small-scale aircraft under development, intended to fly stratospheric survey missions with a ceiling of up to 100,000 ft, is examined. Termed the Mini-Sniffer, the canard aircraft will have a maximum gross takeoff weight of 145 lb and a payload of 25 lb. The two-stroke hydrazine monopropellant reciprocating engine (driving a variable-diameter propeller) is mounted in the aft pusher position to eliminate interference with the nose-mounted air sampling probes. The main wing is a high-aspect-ratio design with a span of 18 ft, an area of 35.5 sq ft, and a sweep angle of 20 degrees.
MAJS: /*AIR POLLUTION/*AIRCRAFT DESIGN/*CANARD CONFIGURATIONS/*ENVIRONMENTAL MONITORING/*REMOTELY PILOTED VEHICLES/*STRATOSPHERE

74A26660
UTTL: Structural aspects of current RPV's
AUTH: A/MOUREY, D. J.
AIAA, ASME, and SAE, Structures, Structural Dynamics and Materials Conference, 15th, Las Vegas, Nev., Apr. 17-19, 1974, AIAA 12 p.
ABS: A review of the current AQM-34, AQM-91, and BGM-34 series of remotely piloted vehicles (RPVs) discloses many structural design requirements similar to their manned counterparts. There are also numerous differences due to the RPV's unique requirements. The results of structural analyses and tests are shown in order to highlight the importance of the C-130 launch airplane upon RPV loads while captive. The important effects are from aerodynamic interference and from elastic structural response of the C-130. Simulation of the dynamics of parachute recovery illustrates the complex nature of this unique RPV structural requirement. Ground impact loads from tests are shown to be a function of recovery weight and the type of terrain upon which the impact occurs.
MAJS: /*AERODYNAMIC LOADS/*AIRCRAFT DESIGN/*REMOTELY PILOTED VEHICLES/*STRUCTURAL DESIGN CRITERIA

74A26410
UTTL: RPRVs - The first and future flights
AUTH: A/REED, R. D.
Astronautics and Aeronautics, vol. 12, Apr. 1974, p. 26-42.
ABS: The merits of the RPRV (remotely piloted research vehicle) concept are discussed, along with its historical background and development culmination in the 3/8-scale F-15. The use of RPRVs is shown to be especially attractive when testing must be done at low cost, or in quick response to demand, or when hazardous testing must assure the safety of proceeding to manned vehicles.
MAJS: /*AIRCRAFT CONTROL/*AUTOMATIC PILOTS/*FLIGHT TESTS/*REMOTELY PILOTED VEHICLES/*RESEARCH VEHICLES

74A25400
UTTL: Remotely piloted vehicles as remote sensing platforms
AUTH: A/YOUNG, J. A.
In: Remote sensing of earth resources; Proceedings of the Second Conference on Earth Resources Observation and Information Analysis System, Tullahoma, Tenn., March 26-28, 1973. Volume 2. (A74-25386 10-13) Tullahoma, Tenn., F. Shahrokhi, University of Tennessee, 1973, p. 269-280.
ABS: Technology advances have made possible a large number of useful and economical remotely piloted vehicles (RPV). The operation of several RPV's is described, and their possible use in remote sensing in the atmospheric and earth resources sciences is discussed. One advantage they may have over remote sensing satellites is that they can obtain greater data density and higher resolution. There are high, low, and intermediate altitude capability needs, various speed and range requirements, a number of structural demands, and a spectrum of payload requirements. Cost advantages are discussed in terms of the coupling of similar needs and vehicle requirements.
MAJS: /*EARTH RESOURCES/*METEOROLOGICAL FLIGHT/*REMOTE SENSORS/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY ASSESSMENT

74A23392
UTTL: American programs for reconnaissance vehicles and remotely piloted airplanes
L'Aeronautique et l'Astronautique, no. 43, 1973, p. 3-7. In French.
ABS: In their initial stage, pilotless planes flew along a programmed flight path or were guided by remote control. Most of them are now actually remotely piloted and are able in this way to perform a range of tasks wider than that of the sole reconnaissance missions. Following a brief review of the previous reconnaissance vehicle programs, the now current developments programs for pilotless airplanes designed for the reconnaissance, designation and attack of targets are detailed.
MAJS: /*PILOTLESS AIRCRAFT/*RECONNAISSANCE AIRCRAFT/*REMOTELY PILOTED VEHICLES

74A14362
UTTL: Remotely piloted vehicles - Necessity, wishful thinking, or plaything
AUTH: A/OLSEN, R.
Flug Revue/Flugwelt International, Dec. 1973, p. 27-30, 35-38. In German.
ABS: Various types of remotely piloted vehicles (RPV) are considered, taking into account the military objectives for which the vehicles are to be used. RPV developed in Germany during the time from 1939 to 1945 are compared with RPV designed in the U.S. after 1945. Attention is given to the Matador TM-61C, the Mace TM-76, the Goose SM-73, the Regulus II, and the SNARK SM-62. Other RPV considered include the Jindivik MK.3, the Beechcraft PD-121, the Beechcraft KDB-1, the Radioplane RP-76, the Ryan Firebee, and the Radioplane XQ-4. Ground-to-air missiles are discussed together with the German space program in the years from 1935 to 1945 and unmanned VTOL platforms for military applications.
MAJS: /*MILITARY AIRCRAFT/*MISSILE DESIGN/*REMOTELY PILOTED VEHICLES

74A11576
UTTL: Further development of the JT15D turbofan
AUTH: A/ANSCHUTZ, R. H.; B/COOK, D. L.
Society of Automotive Engineers, National Aerospace Engineering and Manufacturing Meeting, Los Angeles, Calif., Oct. 16-18, 1973, 13 p.
ABS: When the JT15D engine was first considered for potential high-altitude, low flight speed, long-endurance RPV applications by the U.S. Air Force, the questions were: (1) will the engine run at these altitudes, (2) can it deliver the required thrust, (3) can it deliver the required power extraction, (4) what is the specific fuel consumption, (5) what oil system modifications are needed, (6) what is the optimum control system, and (7) are there other unknowns. A JT15D-4 turbofan engine, with only minor modifications which were easily incorporated into engines coming off the production line, proved more than adequate to achieve predicted endurance goals and measured performance.
MAJS: /*AIRCRAFT PARTS/*ENGINE DESIGN/*ENGINE TESTS/*REMOTELY PILOTED VEHICLES/*TURBOFAN ENGINES

73A45399
UTTL: A review of the American RPV scene.
AUTH: A/STANBLER, I.
Interavia, vol. 28, Oct. 1973, p. 1070-1073.
ABS: The remotely piloted vehicle (RPV) can, in the opinion of its adherents, offer many of the capabilities of manned aircraft for a fraction of the cost. Applications being considered include several reconnaissance roles, electronic warfare systems, target acquisition, weapon delivery, air-to-air combat, and various combinations of these. Vehicles in hardware form include both expendable and nonexpendable systems. A number of current RPV projects undertaken by various manufacturers are

reviewed. It is emphasized that electronics are vital to the success of the overall RPV concept.

MAJS: /*COMBAT/*ELECTRONIC COUNTERMEASURES/*REMOTELY PILOTED VEHICLES/*WEAPON SYSTEMS

73A42533

UTTL: A technology tool for urban applications - The remotely piloted blimp.

AUTH: A/SEEMANN, G. R., B/HARRIS, G. L.; C/BROWN, G. J.; D/CULLIAN, C. A.
American Institute of Aeronautics and Astronautics and Public Technology, Inc., Urban Technology Conference and Technical Display, 3rd, Boston, Mass., Sept. 25-28, 1973, AIAA 8 p. Research sponsored by Developmental Sciences, Inc.

ABS: The remotely piloted blimp concept is to provide flexible, safe, economical airborne surveillance, measurement of monitoring systems for urban applications. The Traffic Eye, Enforcement Eye, and Enviro Eye are basically remotely piloted, ultra slow, low altitude buoyant airborne platforms equipped with television cameras. The flight characteristics of the blimp are discussed together with questions of control, takeoff, landing, and ground support.

MAJS: /*AIRSHIPS/*REMOTELY PILOTED VEHICLES/*TECHNOLOGY UTILIZATION/*URBAN RESEARCH

73A37332

UTTL: Application of self-organizing control to remote piloting of vehicles.

AUTH: A/BARRON, R. L.; B/GAGNON, R. A.
In: Remotely manned systems: Exploration and operation in space; Proceedings of the First National Conference, Pasadena, Calif., September 13-15, 1972. (A73-37301 19-11) Pasadena, Calif., California Institute of Technology, 1973, p. 409-422. USAF-supported research.

ABS: All electrooptical (E-O) and electromagnetic (E-M) instruments for remotely manned spacecraft and aircraft can measure phenomena indicative of the magnitude of the resultant bearing angle (boresight angle) between a fiducial axis in the instrument assembly and an external point target or signal source. It is shown that the remote piloting of vehicles can be materially aided by the use of simple E-O or E-M sensors in primary or backup control systems which can successfully employ self-organizing control logic to process input information under circumstances that would be highly confusing for the remote pilot, thus providing means to augment his actions or take over from him in automatic modes of control.

MAJS: /*MAN MACHINE SYSTEMS/*REMOTE CONTROL/*REMOTE SENSORS /*REMOTELY PILOTED VEHICLES/*SELF ORGANIZING SYSTEMS

73A15379

UTTL: Electronic warfare and remotely piloted vehicles.

AUTH: A/SUMMERS, C. S.
In: NTC '72: National Telecommunications Conference, Houston, Tex., December 4-6, 1972, Record. (A73-15376 04-07) New York, Institute of Electrical and Electronics Engineers, Inc., 1972, p. 2C-1 to 2C-3.

ABS: Discussion of electronic warfare tactics which may be employed against remotely piloted unmanned aircraft serving either for reconnaissance purposes or for weapons delivery. Deception and confusion of the vehicle control system by jamming and false-signal transmissions are examined along with possible capture of control over the vehicle. Countermeasures which may be designed into the vehicle include the use of highly directional antennas and sophisticated signal discrimination systems.

MAJS: /*ELECTRONIC COUNTERMEASURES/*RECONNAISSANCE AIRCRAFT /*REMOTELY PILOTED VEHICLES/*TACTICS/*WARFARE/*WEAPON SYSTEMS

73A12595

UTTL: Introducing the electrostatic autopilot.

AUTH: A/HILL, M. L.
Astronautics and Aeronautics, vol. 10, Nov. 1972, p. 22-31.

ABS: The electrostatic autopilot consists of a patch of radioactive material mounted on each wing tip and on the nose and tail of an aircraft along with two highly sensitive differential voltmeters. The stabilization system developed appears, under the conditions investigated, equal to conventional systems employing precision mechanical gyros. The autopilot weighs about 3 oz., uses milliwatts of power, and has no moving parts. Flight tests conducted with the device are reported, giving attention to the demonstration of pitch stabilization. Ten hours of operational CAT flight of the pitch stabilizing system in early August 1972 yielded numerous quantitative telemetry records. Principles of atmospheric electricity are discussed and a simplified fair weather model for electrostatic stabilization is presented.

MAJS: /*ATMOSPHERIC ELECTRICITY/*AUTOMATIC PILOTS/*ELECTRIC FIELDS/*ELECTROSTATIC CHARGE/*LINES OF FORCE/*REMOTELY PILOTED VEHICLES