Index to 1983 NASA Tech Briefs

Volume 8, Numbers 1-4 **DECEMBER 1986**

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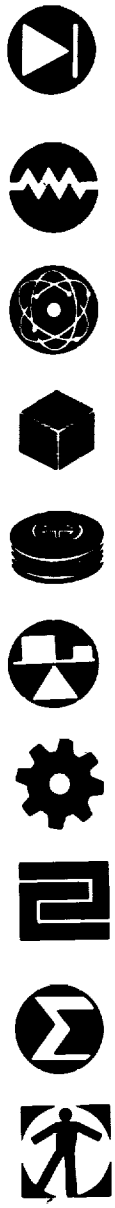

Electronic Components and Circuits

Electronic Systems

Physical Sciences

Materials

Computer Programs

Mechanics

Machinery

Fabrication Technology

Mathematics and Information Sciences

Life Sciences

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INTRODUCTION

Tech Briefs are short announcements of new technology derived from the research and development activities of the National Aeronautics and Space Administration. These briefs emphasize information considered likely to be transferrable across industrial, regional, or disciplinary lines and are issued to encourage commercial application.

This *Index to NASA Tech Briefs* contains abstracts and four indexes — subject, personal author, originating Center, and Tech Brief Number — for 1983 Tech Briefs.

Availability of NASA Tech Briefs

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The January 1982 edition of the *NASA Thesaurus* (NASA SP-7051) is used as the authority for the indexing vocabulary that appears in the subject index. The *NASA Thesaurus* should be consulted in examining the current indexing vocabulary, including associated cross-reference structure. Only the subject terms that have been selected to describe the documents abstracted in this issue appear in the subject index. Copies of the *NASA Thesaurus* may be obtained from the National Technical Information Service at $35.00 for Volume 1 and $20.00 for Volume 2.

Originating Center Prefixes

ARC	Ames Research Center
GSC	Goddard Space Flight Center
HQN	NASA Headquarters
KSC	Kennedy Space Center
LAR	Langley Research Center
LEW	Lewis Research Center
MFS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

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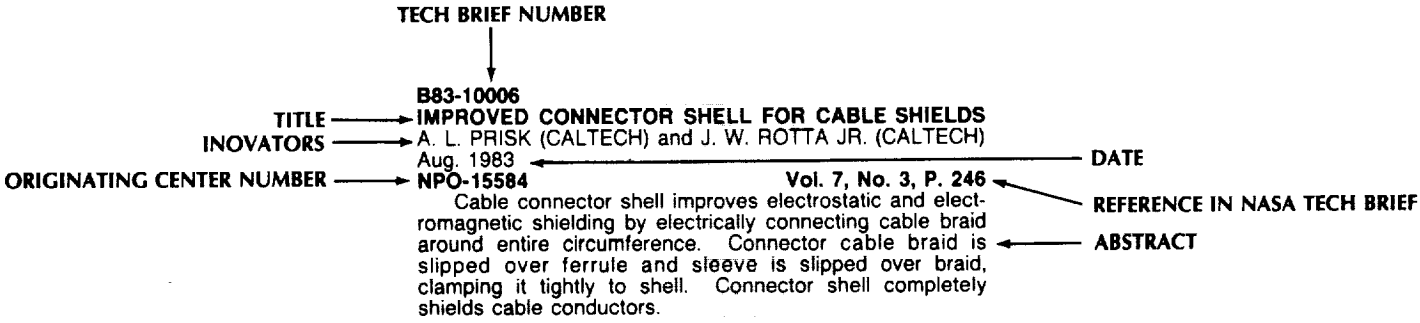
TYPICAL ABSTRACT ENTRY



Index to 1983 NASA Tech Briefs
December 1986

Abstract Section

01 ELECTRONIC COMPONENTS AND CIRCUITS

B83-10001
DIGITAL PHASE-SHIFT STANDARD
J. A. CRAMP (Bionetics Corp.)
May 1983
KSC-11250 **Vol. 7, No. 3, P. 241**

Digital phase-shift standard used in combination with oscillator to calibrate other phase standards and phase-angle voltmeters. Phase-shifter circuit provides two square-wave outputs, A and B, with phase difference between them selectable in 30 degrees increments. Circuit is used with input signals as low as 1 volt rms, in almost any waveform.

B83-10002
PRINTED CIRCUIT CONVERTS RF ENERGY TO DC POWER
J. TRINER and W. BROWN (Raytheon Co.)
Aug. 1983 See Also NASA CR-156866 (N81-274011/NSP)
LEW-13913 **Vol. 7, No. 3, P. 242**

Ultra-light-weight, large area, antenna/rectifier has 85 percent conversion efficiency. System consists of large number of repetitive circuits called 'rectenna elements.' Each element produces 2 W of power, comprises half-wave dipole, input filter, and Schottky barrier dipole. Two-wire microwave transmission lines act as dc power collecting buses.

B83-10003
TWO-WIRE TO FOUR-WIRE AUDIO CONVERTER
G. L. TALLEY JR. and B. L. SEALE
Aug. 1983
KSC-11256 **Vol. 7, No. 3, P. 243**

Simple circuit provides interface between normally incompatible voicecommunication lines. Circuit maintains 40 dB of isolation between input and output halves of four-wire line permitting two-wire line to be connected. Balancing potentiometer, Rg, adjusts gain of IC2 to null feed through from input to output. Adjustment is done on workbench just after assembly.

B83-10004
MEASURING EXCESS NOISE IN SDL'S
S. J. KATZBERG, H. R. KOWITZ, C. W. ROWLAND, T. A. SHULL, S. L. RUGGLES (Kentron International, Inc.), and L. F. MATTHEWS
Aug. 1983
LAR-12938 **Vol. 7, No. 3, P. 244**

New instrument gives quantitive information on 'excess noise' in semiconductor-diode laser (SDL's). By proper selection of detector, instrument tests any SDL from visible wavelengths through thermal infrared. Lasers determine excess noise in SKL source by measuring photocurrent generated in photodetector exposed first to reference laser then to SKL under test.

B83-10005
SOLID-STATE DC CIRCUIT BREAKER
P. HARVEY (American Science and Engineering, Inc.)
Aug. 1983
MFS-25172 **Vol. 7, No. 3, P. 245**

Circuit breaker with no moving parts protects direct-current (dc) loads. Current which circuit breaker opens (trip current) is adjustable and so is time delay before breaker trips. Forward voltage drop rises from 0.6 to 1.2 V as current rises to trip point. Breaker has two terminals, like fuse, therefore replaces fuse in dc circuit. Powered by circuit it protects and reset by either turning off power source or disconnecting load.

B83-10006
IMPROVED CONNECTOR SHELL FOR CABLE SHIELDS
A. L. PRISK (CALTECH) and J. W. ROTTA JR. (CALTECH)
Aug. 1983
NPO-15584 **Vol. 7, No. 3, P. 246**

Cable connector shell improves electrostatic and electromagnetic shielding by electrically connecting cable braid around entire circumference. Connector cable braid is slipped over ferrule and sleeve is slipped over braid, clamping it tightly to shell. Connector shell completely shields cable conductors.

B83-10007
ADD-ON SHIELDING FOR UNSHIELDED WIRE
J. C. KOENIG (CALTECH), J. W. BILLITTI (CALTECH), and J. M. TALLON (CALTECH)
Aug. 1983
NPO-15107 **Vol. 7, No. 3, p. 247**

Fabrication sequence used to produce compact shields slipped into place from free ends of wires already soldered into connectors at other ends. Single shields are formed into harnesses by connecting grounding jumpers. Technique is especially useful for small diameter wire attached to microminiature connectors.

B83-10008
X-RAY DETECTOR FOR 1 TO 30 KEV
G. ALCORN, J. JACKSON JR., P. GRANT, and F. MARSHALL
Aug. 1983
GSC-12682 **Vol. 7, No. 3, P. 248**

Array of silicon X-ray detecting diodes measures photon energy and provides image of X-ray pattern. Regardless of thickness of new X-ray detector, depletion region extends through it. Impinging X-rays generate electrons in quantities proportional to X-ray energy. X-ray detector is mated

to chargecoupled-device array for image generation and processing. Useful in industrial part inspection, pulsed-plasma research and medical application.

B83-10009
LEVEL SENSOR FOR CRYOGENIC FLUIDS
N. E. SIMMONS (Rockwell International Corp.) and R. A. SCHROFF (Rockwell International Corp.)
Aug. 1983
MSC-20302 **Vol. 7, No. 3, p. 249**
Hot wire sensor combined with voltage-comparator circuit monitors liquid level in cryogenic-fluid storage tanks. Sensor circuit adaptable to different liquids and sensors. Constant-current source drives current through sensing probe and fixed resistor. Voltage comparator circuits interpret voltage drops to tell whether probe is immersed in liquid and is current in probe.

B83-10010
DETERMINING SOLAR-CELL OPERATING TEMPERATURE
J. S. GRIFFITH (University of New York at Binghamton), M. S. RATHOD (CALTECH), and J. S. PASLASKI (CALTECH)
Aug. 1983
NPO-15449 **Vol. 7, No. 3, P. 250**
Laboratory test measures effect of windspeed and wind directon. Series of tests shows solar-photovoltaic cell temperature extremely sensitive to windspeed, moderately sensitive to wind direction, and rather insensitive to ambient temperature.

B83-10017
FOCAL-PLANE-ARRAY OPTICAL PROXIMITY SENSORS
A. R. JOHNSTON (CALTECH)
Aug. 1983
NPO-15155 **Vol. 7, No. 3, P. 259**
Objects detected at beam axis intersections. Group of light sources or detectors is mounted in box at focal plane of lens. Box can therefore illuminate or view several axes, each corresponding to source or detector of group. Proximity sensing system developed to trigger braking system of automatically controlled car.

B83-10125
DIGITAL SINGLE-PHASE POWER-FACTOR CONTROLLER
R. W. DABNEY
Oct. 1983
MFS-25861 **Vol. 7, No. 4, P. 369**
Digital circuit has faster response to load changes. Digital power-factor controller senses changing motor-load torques by sampling open-circuit voltage across gate-controlled silicon switch. Circuit responds more rapidly to hanging loads than analog power-factor controllers because no low-pass filter is in feedback loop.

B83-10126
HIDING SOLAR-ARRAY BUS BARS
W. F. HUFNAGEL (Solarex Corp.)
Oct. 1983
NPO-15755 **Vol. 7, No. 4, P. 370**
End terminals mounted under cells, maximizing usable illuminated area. Reconfigured solar panel bus bars placed under cells, reducing portion of module area not occupied by active silicon. Underside of last cell in string of cells serves as contact for positive bus. Negative tab of last cell in string is wrapped around from top of cell. Tabs are connected to output boards mounted under cells.

B83-10127
HIGH POWER SWITCHING TRANSISTOR
P. L. HOWER (Westinghouse Electric Corp.), Y. C. KAO (Westinghouse Electric Corp.), and D. C. CARNAHAN (Westinghouse Electric Corp.)
Oct. 1983 See Also NASA CR-165372 (N81-28353/NSP) and NASA CR-165547 (N82-18506/NSP)
LEW-13728 **Vol. 7, No. 4, P. 371**
Improved switching transistors handle 400-A peak currents and up to 1,200 V. Using large diameter silicon wafers with twice effective area as D60T, form basis for D7 family of power switching transistors. Package includes npn wafer, emitter preform, and base-contact insert. Appliations are: 25 to 50-kilowatt high-frequency dc/dc inverters, VSCF converters, and motor controllers for electrical vehicles.

B83-10128
MEASURING TENSION IN TRANSISTOR SUSPENSIONS
W. P. HUBBARD (CALTECH)
Oct. 1983
NPO-15677 **Vol. 7, No. 4, P. 372**
Vibration analyis is nondestructive and noninvasive. Transistor isolated from heat (or cold) of surroundings by filament suspension. Filaments made of polyester are (0.005 in) 0.127 mm in diameter. Transistor lead wires are wrapped around certain filaments. Applicable for testing filament mounts too delicate for testing by tension probes.

B83-10129
DETECTING SOLAR-CELL FAILURES
T. J. MALONEY (AIA Research Corporation)
Oct. 1983
NPO-15741 **Vol. 7, No. 4, P. 373**
Circuit identified malfunctioning photovoltaic array. Cell-failure detection circuit compares output of photovoltaic array to control cell. If any module fails, activates light-emitting diode. Circuit could also sound alarm.

B83-10130
DEVELOPING STANDARDS FOR PHOTOVOLTAIC DEVICES
A. R. HOFFMAN (CALTECH), R. G. ROSS JR. (CALTECH), and S. H. GASNER (CALTECH)
Oct. 1983
NPO-15734 **Vol. 7, No. 4, P. 374**
Ground rules outlined for evaluating photovoltaic technology. Document addresses number of performance attributes: electrical, thermal, mechanical, structural, safety, reliability, durability, installation, operation, maintenance, building and site. Each criterion includes user need or expectation for element and describes method of test.

B83-10131
ELECTRONIC-POWER-TRANSFORMER DESIGN GUIDE
G. E. SCHWARZE, J. C. LAGADINOS (MagCap Engineering, Inc.), and J. F. AHEARN (MagCap Engineering, Inc.)
Oct. 1983 See Also NASA CR-134992 (N78-29353/NSP)
LEW-13208 **Vol. 7, No. 4, P. 374**
Compilation of information on design procedures, electrical properties, and fabrication. Guide provides information on design procedures; magnetic and insulating material electrical properties; impregnating, encapsulating and processing techniques.

B83-10247
BAND-PASS AMPLIFIER WITHOUT DISCRETE REACTANCE ELEMENTS
L. KLEINBERG
Apr. 1984
GSC-12788 **Vol. 8, No. 1, P. 03**
Inherent or 'natural' device capacitance exploited. Band-Pass Circuit has input impedance of equivalent circuit at frequencies much greater than operational-amplifier rolloff frequency. Apparent inductance and capacitance arise from combined effects of feedback and reactive component of amplifier gain in frequency range.

B83-10248
PHASE DETECTOR FOR POWER-FACTOR CONTROLLER
F. J. NOLA

Apr. 1984
MFS-25854 **Vol. 8, No. 1, P. 04**

Positive feedback assures reliable switching. Three Phase Power Factor Controller includes three phase detectors, each produces rectangular waves of duration approximately equal to lag time between line voltage and motor current.

B83-10249
POWER-FACTOR CONTROLLER WITH FAST LOAD RESPONSE
F. J. NOLA
Apr. 1984
MFS-25852 **Vol. 8, No. 1, P. 05**

Sudden changes in induced emf sensed. In refinement of soft starting three phase power-factor controller, additional components enable circuit to respond quickly to sudden increase in motor load. Rapid-load-response addition senses induced motor emf to detect sudden load increase and generates command signal to increase applied power in response.

B83-10250
SHIELDED ALUMINUM FLAT-CONDUCTOR CABLE
S. FARINA (Flexible Circuits, Inc.)
Innovator Not Given(Lockheed Missiles & Space Co., Inc. Apr. 1984
MFS-25899 **Vol. 8, No. 1, P. 07**

Thin wiring harness stores compactly. Flat aluminum conductors glued between layers of polyimide. Aluminum shield surrounds insulated conductors. Outer layer polyimide. Aluminum shield reduces flexibility of cable and cable withstand only limited number of repetitions of sharp bending at same spot.

B83-10251
CONICAL ELECTRICAL CONNECTORS ALINE EASILY
K. H. CLARK
1984
MFS-25211 **Vol. 8, No. 1, P. 08**

Rotational alinement not critical in design useful for remote manipulators. Plug and socket pushed together, plug rings deflect spring segments of corresponding socket ring. Particularly suitable for remote manipulators and making connections in 'blind' locations.

B83-10252
DIRECTIONAL COUPLER WITH INCREASED DIRECTIVITY
H. M. PICKETT (CALTECH) and A. E. CHIOU (CALTECH)
Apr. 1984
NPO-15892 **Vol. 8, No. 1, P. 9**

Diffraction loss reduced by curving one reflector. In improved diplexer, adjustable reflector has toroidal curvature to reduce diffraction loss through open cavity ends. Primarily used in local oscillator diplexers, new design increases signal to noise ratios and therefore ranges of millimeter and submillimeter hetrodyne receivers.

B83-10253
USING A PFET TO COMMUTATE AN SCR
D. B. EDWARDS (CALTECH) and W. E. RIPPLE (CALTECH)
Apr. 1984
NPO-15282 **Vol. 8, No. 1, P. 10**

Accidental turn-on prevented. PFET diverts load current around SCR to prevent false SCR triggering from current and voltage switching transients. New circuit used in all types of single phase and polyphase Inverters and in buck-boost-, and flyback regulators.

B83-10254
DIGITAL SOLDERING-IRON TESTER
R. N. BUGGLE (Honeywell, Inc.) and W. H. METKA JR. (Honeywell, Inc.)
Apr. 1984
MFS-25863 **Vol. 8, No. 1, P. 12**

Instrument reads tip temperature and contact potential in seconds. Tinned soldering tip touched to temperature sensitive button for 4 seconds and to voltage probe for 1 to 3 seconds. Tip temperature and voltage appear on digital displays. Instrument quickly gives assurance conditions are correct for reliable soldering.

B83-10255
ERROR-COMPENSATED INTEGRATE AND HOLD
M. MATLIN
Apr. 1984
ARC-11303 **Vol. 8, No. 1, P. 12**

Differencing circuit cancels error caused by switching transistors capacitance. In integrate and hold circuit using JFET switch, gate-to-source capacitance causes error in output voltage. Differential connection cancels out error. Applications in systems where very low voltages sampled or many integrate-and -hold cycles before circuit is reset.

B83-10256
PAIRWISE COMPARISON OF VOLTAGE SETS
C. M. VERBER (Battelle Columbus Laboratories) and R. P. KENAN (Battelle Columbus Laboratories)
Apr. 1984
LAR-12929 **Vol. 8, No. 1, P. 13**

Optical preprocessor compares 16 incoming signals with reference voltages. Integrated optical substraction to take 'vector difference' of two sets of analog voltages. Applications include satellite onboard processing of pictorial data so data not useful discardes; device recognizes presence of accessive cloud cover and signals hault to data transmission.

B83-10257
STABILIZING CRYSTAL OSCILLATORS WITH MELTING METALS
J. B. STEPHENS (Caltech) and C. G. MILLER (Caltech)
Apr. 1984
NPO-15641; NPO-15642; NPO-15643 Vol. 8, No. 1, P. 14

Heat of fusion provides extended period of constant temperature and frequency. Crystal surrounded by metal in spherical container. As outside temperature rises to melting point of metal, metal starts to liquefy; but temperature stays at melting point until no solid metal remains. Potential terrestrial applications include low-power environmental telemetering transmitters and instrumentation transmitters for industrial processes.

B83-10258
SCM HANDBOOKS FOR DC-TO-DC CONVERTERS
F. LEE (Virginia Polytechnic Institute and State University), M. MOHMOUD (Virginia Polytechnic Institute and State University), and Y. YU (TRW Defense and Space Systems Group)
Apr. 1984 SEE ALSO NASA CR-165172 (N81-10301/NSP) and NASA CR-165173 (N8111314/NSP)
LEW-13886 **Vol. 8, No. 1, P. 15**

Two documents aid in design of control modules for dc-to-dc converters. Features of SCM include: Adaptive stability, power component stress limiting, implementation of various control laws, unified design approach. Analysis and quidelines contained in handbooks enable engineer to design SCM circuit and confidently predict resulting overall performance.

B83-10259
SOLID-STATE CROSSBAR SWITCH
T. O. ANDERSON (CALTECH)
Apr. 1984
NPO-15066 **Vol. 8, No. 1, P. 16**

Combines analog and digital circuits for multiline/multiport switching. Bidirectional solid-state crossbar switch provides interfacing and switching for 16 X24 coordinate ports for 16 parallel signal lines. Intended for rapid manual-controlled or computer controlled reconfiguration of distributed computing systems.

B83-10260
DETECTING DEFECTIVE SOLDER BONDS
R. PAULSON (Lockheed Missiles & Space Co., Inc.), J. BARNEY (Lockheed Missils & Space Co., Inc.), and H. J. DECKER
Apr. 1984
MFS-25507 **Vol 8, No. 1, P. 16**
Method is noncontact and nondestructive. Technique detects solder bonds in solar array of other large circuit board, using thermal-imaging camera. Board placed between heat lamp and camera. Poor joints indicated by 'cold' spots on the infrared image.

B83-12261
BLOWING DUST AWAY WITH ELECTROSTATIC WIND
M. G. UTTER (University of Arizona)
Apr. 1984
HQN-10936 **Vol. 8, No. 1, P. 16**
Ionized air molecules drive away contaminants. Electrostatic wind prevents dust buildup and subsequent electrical breakdown in powerlines, transformers, switchgears, Van de Graaff generators, electrostatic precipitators, and other high-voltage equipment. Makes periodic cleaning or airblasting unnecessary.

B83-10262
IMPROVED COIL FOR HYDROGEN DISSOCIATORS
R. VESSOT (Smithsonian Institution)
Apr. 1984
MFS-25638 **Vol. 8, No. 1, P. 16**
Flat coil has rigid printed circuit substrate. New coil structure minimizes RF electric field near glass walls of plasma vessel; therefore reduces direct electron bombardment of glass. Design lends itself well to high production and standardized dimensions.

B83-10263
THE EFFECT OF COSMIC RAYS ON MSI DEVICES
D. K. NICHOLS (CALTECH), W. E. PRICE (CALTECH), and J. P. WOODS (MIT)
Apr. 1984
NPO-15779 **Vol. 8, No. 1, P. 16**
Low-power devices susceptible to cosmic-ray particles. Five MSI device technologies, including TTL, low power TTL, Schottky, CMOS, and low-power Schottky, subjected to 120-MeV krypton-ion beam from cyclotron and monitored for single-event upset. Results find terrestrial application for radiation hardening of electronic devices and systems.

B83-10264
COOLING WAVEGUIDE FLANGES IN MICROWAVE TRANSMITTERS
B. C. CHEN (CALTECH)02(CALTECH) and R. W. HARTOP
Apr. 1984
NPO-15401 **Vol. 8, No. 1, P. 16**
Flang appendage circulates coolant for conductive heat removal. Flange appendage bore accomodates coolant tube. O-ring surrounds bore; when adjacent waveguide sections are bolted together, continuous conduit is formed for coolant. Pressure release groove in modified flange prevents coolant from entering waveguide should O'ring seal fail.

B83-10265
UNCOOLED IR DETECTOR
P. J. SHLICHTA (CALTECH)
Apr. 1984
NPO-14832 **Vol. 8, No. 1, P. 17**
Detector combines liquid crystal film with light-sensitive solid-state array. Liquid-crystal film acts as IR detector when maintained just below temperature of transition from opacity to transparancey. When IR radiation is absorbed by film, resultant heating changes visiblelight transmission, modulating uniform visible light beam as it passes through film.

B83-10267
IMPROVED TWO-PHASE SWITCHING REGULATOR
W. E. RIPPEL (CALTECH)
Apr. 1984
NPO-15172 **Vol. 8, No. 1, P. 17**
Coupled-inductor polyphase regulator has better efficiency and lower inductor losses. Improved two-phase switching regulator employs negative coupling between inductors to achieve better power-to-weight ratio while reducing peak switching currents and inductor losses. Improvement of about 35 percent using new technique.

B83-10268
TI/PD/CU CONTACTS FOR SEMICONDUCTOR DEVICES
R. B. CAMPBELL (Westinghouse Electric Corp.) and A. ROHATGI (Westinghouse Electric Corp.)
Apr. 1984
NPO-15043 **Vol. 8, No. 1, P. 17**
Copper systems equivalent in performance to silver or gold systems. Titanium layer and palladium layer deposited on semiconductor device by electron beam evaporation. Desired pattern etched using photoresist. Thin layer of copper plated on contact pattern from cyanide solution. Copper layer then built up to 4 to 8 microns by electroplatng from acid solution.

B83-10269
IMPROVED HIGH-CURRENT DRIVE CIRCUIT
S. W. COLE (CALTECH)
Apr. 1984
NPO-14938 **Vol. 8, No. 1, P. 17**
Uses VMOS field-effect power transistor. High-current drive circuit employs n-channel enhancement-mode VMOS field-effect power transistor to eliminate problem of oscillation at high power encountered in conventional circuits with bipolar transistors. Drive voltage required is typically 1 to 3 V for load current of 10 A.

B83-10270
PROGRAMABLE POWER CONDITIONER
J. R. LANIER, R. E. KAPUSTKA, and J. R. GRAVES
Apr. 1984
MFS-25531 **Vol. 8, No. 1, P. 18**
Accepts range of inputs and produces range of outputs. Versatile power conditioner programed to handle power from wide range of sources such as solar arrays, fuel cells, and electrochemical batteries. Conditioner consists of two parts. Power stage is switching regulator. Controller stage uses microprocessor to generate analog control signal for power stage.

B83-10271
ANTENNA FOR IMAGING SEA ICE
F. T. BARATH (CALTECH) and R. L. JORDAN (CALTECH)
Apr. 1984
NPO-15352 **Vol. 8, No. 1 P. 18**
Antenna for imaging of polar regions has terrestrial applications. Antenna consists of four horizontally-polarized 19.0 by 0.6-m planar waveguide arrays and appropriate feed networks mounted on single aluminum supporting structure. Antenna suitable for high quality imaging of sea ice in polar regions above 60 degrees latitude.

B83-10497
INFRARED-RESPONSIVE MONOLITHIC MOS CIRCUIT
Nov. 1984
GSC-12782 **Vol. 8, No. 2, P. 165**
Lead chalcogenide photoresistors integrated with FET amplifiers. Circuit combines voltage divider containing lead chalcogenide photoresistor with FET source follower. Source and drain of FET p-doped regions in underlying n-type silicon wafer. All other structures formed at or deposited above original surface plane of wafer.

B83-10498
LOW-NOISE SUBMILLIMETER-WAVE DIODE

R. J. MATTAUCH (University of Virginia)
Nov. 1984
NPO-15935 **Vol. 8, No. 2, P. 166**

Low noise achieved without usual high resistance. Barrier of p-type material placed between metal anode and heavily-doped gallium arsenide. Ntype epitaxial layer eliminated. Barrier prevents quantum tunneling of electrons between semiconductor and metal. Higher breakdown structure provided.

B83-10499
SIMPLIFIED HIGH-POWER INVERTER
D. B. EDWARDS (CALTECH) and W. E. RIPPEL (CALTECH)
Nov. 1984
NPO-15961 **Vol. 8, No. 2, P. 167**

Solid-state inverter simplified by use of single gate-turnoff device (GTO) to commutate multiple silicon controlled rectifiers (SCR's). By eliminating conventional commutation circuitry, GTO reduces cost, size and weight. GTO commutation applicable to inverters of greater than 1-kilowatt capacity. Applications include emergency power, load leveling, drives for traction and stationary polyphase motors, and photovoltaic-power conditioning.

B83-10500
ENERGY-SAVING INVERTER
W. E. RIPPEL (CALTECH) and D. B. EDWARDS (CALTECH)
Nov. 1984
NPO-15291 **Vol. 8, No. 2, P. 168**

Commutation by field-effect transistor allows more efficient operation. High voltage field-effect transistor (FET) controls silicon controlled rectifiers (SCR's). Circuit requires only one capacitor and one inductor in commutation circuit: simpler, more efficient, and more economical than conventional inverters. Adaptable to dc-to-dc converters.

B83-10501
SCHOTTKY-BARRIER PHOTOCELL WITH INTERMEDIATE METAL LAYER
G. E. ALCORN, C. Z. LEINKRAM, and O. OKUNOLA
Nov. 1984
GSC-12816 **Vol. 8, No. 2, P. 169**

Device output and durability increased. Photosensitive GaAs Schottkybarrier device modified by addition of intermediate layer of refractory or alkaline earth metal. Photovoltaic cells and photosensors made with new design put out higher short-circuit currents and better able to withstand rigors of handling and connection to other circuit components.

B83-10502
FEEDTHROUGH SEAL FOR HIGH-PRESSURE VESSEL
R. WILLIAMS, O. MULLINS (Lockheed Engineering and Management Services Co., Inc.), D. SMITH (Lockheed Engineering and Management Services Co., Inc.), and G. TEASLEY (Lockheed Engineering and Management Services Co., Inc.)
Nov. 1984 See Also NASA TM-8251
MSC-20625 **Vol. 8, No. 2, P. 170**

Combination of ceramic and plastic withstands many depressurizations. Stack of washers surrounds leadthrough electrode. Under pressure washers expand to fill leadthrough hole in high-pressure vessel. Seal thus formed withstands 20 or more pressurization/depressurization cycles. Seal composed of neoprene, polytetrafluoroethylene, nylon and high-purity, high-density commercial alumina ceramic.

B83-10503
STRIPLINE ANTENNA BEAM-FORMING NETWORK
P. W. CRAMER (CALTECH)
Nov. 1984
NPO-15743 **Vol. 8, No. 2, P. 171**

Stripline antenna beam-forming network includes 87 beam ports and 136 feed-element ports and contained on only two microstrip boards. Both uplink and downlink strips supported on same boards. Originally used for communications coverage of continental United States for Land Mobile Satellite System, structure of interest to antenna designers in other applications.

B83-10504
FINDING OPEN FAULTS IN CMOS CIRCUITS
R. CHANDRAMOULI (CALTECH)
Nov. 1984
NPO-15838 **Vol. 8, No. 2, P. 171**

Algorithm specifies sequence of input test signals and interpretation of resulting output signals for identifying stuck-open faults in complementary metal-oxide semiconductor (CMOS) integrated logic circuits. Incorporated in software for online production testing of CMOS circuits.

B83-10505
FLIP-FLOP DIGITAL MODULATOR
R. F. ENO (Rockwell International Corp.)
Nov. 1984
MSC-20334 **Vol. 8, No. 2, P. 172**

Clock switched on and off in response to data signal. Flip-flop modulator generates square-wave carrier frequency that is half clock frequency and turns carrier on and off. Final demodulator output logical inverse of data input.

B83-10506
SCREENING PLASTIC-ENCAPSULATED SOLID-STATE DEVICES
L. BULDHAUPT (The Boeing Aerospace Co.)
Nov. 1984 See Also NASA CR-161946 (N82-16343/NSP) and NASA CR-161947 (N82-16344/ NSP)
MFS-25802 **Vol. 8, No. 2, P. 173**

Suitability of plastic-encapsulated solid-state electronic devices for use in spacecraft discussed. Conclusion of preliminary study was plasticencapsulated parts sufficiently reliable to be considered for use in lowcost equipment used at moderate temperature and low humidity. Useful to engineers as guides to testing or use of plastic encapsulated semiconductors in severe terrestrial environments.

B83-10507
RADIATION-HARDNESS DATA FOR SEMICONDUCTOR DEVICES
W. E. PRICE (CALTECH), D. K. NICHOLS (CALTECH), S. F. BROWN (CALTECH), M. K. GAUTHIER (CALTECH), and K. E. MARTIN (CALTECH)
Nov. 1984
NPO-15787 **Vol. 8, No. 2, P. 174**

Document presents data on and analysis of radiation hardness of various semiconductor devices. Data specifies total-dose radiation tolerance of devices. Volume 1 of report covers diodes, bipolar transistors, field effect transistors, silicon controlled rectifiers and optical devices. Volume 2 covers integrated circuits. Volume 3 provides detailed analysis of data in volumes 1 and 2.

B83-10508
OPTICAL TESTING OF INTEGRATED CIRCUITS
J. ERICKSON (Hughes Aircraft Co.)
Nov. 1984
MFS-25498 **Vol. 8, No. 2, P. 174**

Optical spot-raster scanner produces weighted photoresponse image (PI) of operating CMOS IC. Digital analysis of PI's, which correlates differences in PI's with electrical behavior of IC, shows promise both as 100-percent screening method for use in IC manufacture and as diagnostic tool in IC development.

B83-10509
DEMODULATOR FOR AM AND SSB-SC SIGNALS
C. P. HEARN and E. S. BRADSHAW
Nov. 1984
LAR-12716 **Vol. 8, No. 2, P. 174**

Compatible linear demodulator (CLD) detects either amplitude modulation (AM) or single-sideband suppressed-carrier (SSB-SC) modulation. Carrier recovery homodyne

product detector designed for voice communication but easily scaled to other frequencies.

B83-10510
CONTROLLING AN INVERTER-DRIVEN THREE-PHASE MOTOR
C. DOLLAND (Airesearch Manufacturing Co.)
Nov. 1984
MFS-25215 **Vol. 8, No. 2, P. 175**
Control system for three-phase permanent-magnet motor driven by linecommutated inverter uses signals generated by integrating back emf of each phase of motor. High-pass filter network eliminates low-frequency components from control loop while maintaining desired power factor.

B83-10511
SHIELDING ELECTRIC CONNECTORS FROM LIGHTNING
W. B. PIERCE (CALTECH) and W. G. COLLINS (CALTECH)
Nov. 1984
NPO-15688 **Vol. 8, No. 2, P. 175**
Metallic shield for plastic-body electric power connectors, with provision for attaching cable shielding, prevents lightning-induced overvoltages from damaging sensitive electronic equipment.

B83-10512
REMOTELY-OPERATED TRAFFIC CONTROL LIGHT
J. S. REEDY
Nov. 1984
ARC-11406 **Vol. 8, No. 2, P. 175**
Traffic warning light for school crossing, construction zones, and other hazardous areas activated by remote control. Apparatus consists of small radio transmitter, pole-mounted strobe light with attached power supply and radio receiver.

B83-10513
SERVO LEAD COMPENSATION
E. BUCHANAN (Rockwell International Corp.)
Nov. 1984
MFS-19614 **Vol. 8, No. 2, P. 175**
Circuit for continuously varying lead compensation in servosystem operative even when integrating amplifier goes into saturation.

B83-10514
DIGITAL CONTROL OF ANALOG DETECTOR
J. BROWN (Rockwell International Corp.)
Nov. 1984
MFS-19608 **Vol. 8, No. 2, P. 175**
Reference level required to set switching point of analog comparator at desired level determined and set by computer controlled circuit.

B83-10515
MINIATURE TEMPERATURE-CONTROL CIRCUIT
R. H. COUCH
Nov. 1984
LAR-12900 **Vol. 8, No. 2, P. 175**
Operates on any power supply voltage from 6 to 28 volts. Miniature thermostate circuit controls electric heating element to maintain constant temperature in oven or other thermal environment.

B83-10516
POWER-MEASUREMENT ERRORS DUE TO INSTRUMENT LAG
D. P. ATHANS (CALTECH)
Nov. 1984
NPO-15029 **Vol. 8, No. 2, P. 176**
Short-risetime pulses contain frequency components above flat-response region of typical instrumentation amplifiers.

B83-10517
MULTIPLE-BAND-GAP SOLAR-CELL CONCEPT
A. A. NUSSBERGER (Rockwell International Corp.)
Nov. 1984
MFS-25724 **Vol. 8, No. 2, P. 176**
Multiple band gap photovoltaic structures convert greater portion of insolation to electricity than present solar cells.

B83-10518
CONTINUITY/ISOLATION CHECKER
J. O. LONBORG
Nov. 1984
NPO-15632 **Vol. 8, No. 2, P. 176**
Buzzer indicates very high or very low resistance between probes. Instrument checks for either continuity or isolation between two points in electrical circuit.

B83-10519
HIGH-COMMON-MODE-REJECTION DIFFERENTIAL AMPLIFIER
F. E. LUKENS
Nov. 1984
MFS-25868 **Vol. 8, No. 2, P. 176**
High-common-mode-refection differential amplifier amplifies low-level signals in presence of high frequency noise. Amplifier used in power system requiring current monitoring on high side of high-voltage powerline.

B83-10520
PAINT-THICKNESS CHECKER
C. NELSON (Beech Aircraft Corp.)
Nov. 1984
KSC-11270 **Vol. 8, No. 2, P. 176**
Eddy-current flaw detector with cathode-ray tube (CRT) used to compare layer thickness of conductive paint on metallic substrates.

02 ELECTRONIC SYSTEMS

B83-10011
FAST ELECTRONIC SOLAR CELL TESTER
J. W. LATHROP (Clemson University) and C. R. SAYLOR (Clemson University)
Aug. 1983
NPO-15676 **Vol. 7, No. 3, P. 253**
Microcomputer controlled system gather current and voltage data. System consists of light source, microcomputer, programable dc power supply, analog/digital interface, and data storage display equipment. Applies series of test loads to cell via programable dc power supply to obtain I/V characteristic curve and key cell-peformance parameter. Apparatus and programming technique are applicable to devices such as batterles and sensors.

B83-10012
EFFICIENT DISTRIBUTION OF FREQUENCY-STANDARD SIGNALS
R. F. MEYER (CALTECH), R. L. SYDNOR (CALTECH), and J. W. MACCONNELL (CALTECH)
Aug. 1983
NPO-15392 **Vol. 7, No. 3, P. 255**
Low power system distributes precise frequency standard signal to network of remote stations. Reference frequency at phase angle modulates transmitter at master transmitter/receiver circuit and recovers at remote circuit. Two circuits continuously transmit on microwave or optical signals 100 MHz apart to effect synchronization of reference frequency and phase.

B83-10013
CODING FOR SINGLE-LINE TRANSMISSION
L. G. MADISON (Martin Marietta Corp.)
Aug. 1983
KSC-11220 **Vol. 7, No. 3, P. 256**
Digital transmission code combines data and clock signals into single waveform. MADCODE needs four standard integrated circuits in generator and converter plus five small discrete components. MADCODE allows simple coding and decoding for transmission of digital signals over single line.

B83-10014
ROUNDING TECHNIQUE FOR HIGH-SPEED DIGITAL SIGNAL PROCESSING
E. R. WECHSLER (CALTECH)
Aug. 1983
NPO-15307 **Vol. 7, No. 3, P. 257**
Arithmetic technique facilitates high-speed rounding of 2's complement binary data. Conventional rounding of 2's complement numbers presents problems in high-speed digital circuits. Proposed technique consists of truncating K + 1 bits then attaching bit in least significant position. Mean output error is zero, eliminating introducing voltage offset at input.

B83-10015
RECEIVER FOR ANTENNA ARRAYS
M. H. BROCKMAN (CALTECH) and M. F. EASTERLING (CALTECH)
Aug. 1983
NPO-15089 **Vol. 7, No. 3, P. 257**
Diversity reception system combines narrow-band signals from several antennas to yield amplified demodulated signal. System was developed for spacecraft command signals, which typically have bandwidths of few hundred hertz.

B83-10016
SEARCHING FOR CLEAR-AIR TURBULENCE
B. L. GARY (CALTECH)
Aug. 1983
NPO-15351 **Vol. 7, No. 3, P. 258**
System for determining potential location and severity of clear-air turbulence based on passive microwave sensor. Horn antenna for prototype clearair-turbulence warning system rotatable through plus or minus 45 degrees. Permits safer more comfortable flights for commercial airplanes and enables safer inflight refueling for military airplanes.

B83-10018
IMPROVING CONTROL OF REMOTE MANIPULATORS
A. K. BEJCZY (CALTECH)
Aug. 1983
NPO-15049 **Vol. 7, No. 3, P. 260**
Advanced theoretical and experimental developments in field of remote manipulators discussed in conference preprint. Report synthesizes number of sensing and control techniques.

B83-10132
MICROCOMPUTER MULTIPLEXES ALPHANUMERIC LABELS ON CRT'S
T. COOPER (Narco Scientific)
Oct. 1983
MSC-20079 **Vol. 7, No. 4, P. 377**
External, low-power alphanumeric label generator eliminates costly video circuitry. Microprocessor-based system for multiplexing alphanumeric and analog data stores both program and data. Uses inexpensive circuits, consumes minimal current, is programmable by user, adapts to many CRT monitors. System generates 5-by-7 dot-matrix characters. System speed is adaquate for medical monitoring purposes.

B83-10133
NRZ DATA ASYMMETRY CORRECTOR AND CONVOLUTIONAL ENCODER
H. J. PFIFFNER (Hughes Aircraft Co.)
Oct. 1983
MSC-20187 **Vol. 7, No. 4, P. 379**
Circuit compensates for timing, amplitude and symmetry perturbations. Data asymmetry corrector and convolutional encoder regenerate data and clock signals in spite of signal variations such as data or clock asymmetry, phase errors, and amplitude variations, then encode data for transmission.

B83-10134
LINKING 'SMART' MODULES BY A SINGLE CHANNEL
W. H. KOHL (CALTECH)
Oct. 1983
NPO-15342 **Vol. 7, No. 4, P. 379**
System architecture brings order to potentially chaotic situation. New configuration allows many 'smart' modules (each containing memory and microprocessor) to be linked by common data channel. Architecture allows each module to carry on operations at own data rate within block of time, while communications between modules occur in strict synchronism.

B83-10135
RADAR FOR MAPPING SEA ICE
F. T. BARATH (Caltech) and R. L. JORDAN (Caltech)
Oct. 1983
NPO-15350 **Vol. 7, No. 4, P. 381**
X-band system has 100-m2 resolution. Wide swath imaging radar of synthetic aperature type transmits signal to ground station for subsequent processing into imagery. Concept meets functional requirements for continuously mapping sea ice in north and south polar regions.

B83-10136
VLSI UNIT FOR TWO-DIMENSIONAL CONVOLUTIONS
K. Y. LIU (Caltech)
Oct. 1983
NPO-15224 **Vol. 7, No. 4, P. 382**
Universal logic structure allows same VLSI chip to be used for variety of computational functions required for two dimensional convolutions. Fast polynomial transform technique is extended into tree computational structure composed of two units: fast polynomial transform (FPT) unit and Chinese remainder theorem (CRT) computational unit.

B83-10137
CIRCUITRY FOR ANGLE MEASUREMENTS
J. R. CURRIE and R. R. KISSEL
Oct. 1983
MFS-25825 **Vol. 7, No. 4, P. 383**
Angle resolver pulsed and read under microprocessor control. Pulse generator excites resolver windings with dual slope pulse. System sequentially reads sine and cosine windings. Microprocessor determines angle through which resolver shaft turned from reference angle. Suitable applications include rate tables, antenna direction controllers, and machine tools.

B83-10138
MEASURING POWER FLOW IN ELECTRIC VEHICLES
J. GRIFFIN, DANIELC. (CALTECH) and G. A. WIKER (CALTECH)
Oct. 1983
NPO-15514 **Vol. 7, No. 4, P. 384**
Instrument accommodates fast rise and fall times of waveforms characteristic of modern, efficient power controllers. Power meter multiplies analog signals proportional to voltage and current, and converts resulting signal to frequency. Two mechanical counters provided: one for charging, one for discharging.

B83-10139
PORTABLE DATA LOGGER FOR PHOTOVOLTAIC PANELS
S. W. COLE (CALTECH)
Oct. 1983
NPO-15158 **Vol. 7, No. 4, P. 385**
Instrument measures rapidly changing knee of V-I curve with extra care. Portable data logger runs on own batteries. Includes microcomputer, which controls voltage-, current-measurement increment, and solid state memory, which stores data until transferred to EPROM module. Data logger is light, compact and easily caried to remote field locations.

B83-10272
LIGHTNING-TRANSIENT RECORDER
R. L. GRUMM (CALTECH)
Apr. 1984
NPO-15895 **Vol. 8, No. 1, P. 21**
Battery-powered system operates for more than one year. Recorder digitizes and records up to 146 current samples at selected intervals during lightning stroke. System continues to store time tags of lightning strokes even if transient current memory is full.

B83-10273
VIRTUAL-CENTER ANTENNA-ARRAYING SYSTEM
L. J. DEUTSCH (CALTECH), J. W. LAYLAND (CALTECH), R. G. LIPES (CALTECH), and R. L. MILLER (CALTECH)
Apr. 1984
NPO-15874 **Vol. 8, No. 1, P. 22**
Separate signals averaged to produce reference frequency and phase. System develops reference carrier from separate received signals. Phase of signal at each receiver determined by comparison with reference phase. Useful in applications requiring accurate phase estimates: reception of weak telemetry signals, transmitter or reflector locating, nondestructive testing of structures, or geophysical exploration.

B83-10274
PHASED-ANTENNA-ARRAY CONICAL SCANNING
J. R. LESH (CALTECH)
Apr. 1984
NPO-15899 **Vol. 8, No. 1, P. 23**
Antenna pointing faster than mechanical scanning. Three antenna phased array connected to receiving signal-processing system through two phase-shifting networks. Two networks simultaneously steer phased array in two slightly-different beam directions; one for scanning, one for tracking. Technique has many uses in military and civilian radar, principally in tracking aircraft, balloonborne weather instruments, and other moving signal sources or reflectors.

B83-10275
BINARY CORRELATOR FOR ELECTROMAGNETIC SIGNAL PATTERNS
J. B. GARRISON (Johns Hopkins University) and R. E. JENKINS (Johns Hopkins University)
Apr. 1984
GSC-12714 **Vol. 8, No. 1, P. 24**
Modulation patterns recognized with extensive calculations. Set of shift registers contains patterns of 1's and 0's representing presence or absence of received signal in designated time/frequency bins. Pattern in shift registers correlated with pattern of expected signal by shifting each cell to right according to expected pattern and summing shift-register outputs in analog summing network. Useful in applications requiring identification of smaller pattern of 1-bit data within larger matrix of such data.

B83-10276
RADAR CUTS SUBSOIL SURVEY COSTS
R. JOHNSON (U.S. Department of Agriculture) and R. GLACCUM (Technos, Inc.)
Apr. 1984
KSC-11227 **Vol. 8, No. 1, P. 25**
Soil features located with minimum time and labor. Ground-penetrating radar (GPR) system supplements manual and mechanical methods in performing subsurface soil survey. Mobile system obtains graphic profile of soil discontinuities and interfaces as function of depth. One or two test borings necessary to substantiate soil profile. GPR proves useful as reconnaissance tool.

B83-10277
'FUEL GAGE' FOR ELECTRIC VEHICLES
J. J. ROWLETTE (CALTECH)
Apr. 1984
NPO-15759 **Vol. 8, No. 1, P. 26**
Gas-emmission and time-integrated-current measurements indicate battery charge state. Tests indicate possibility of monitoring state of charge of lead/acid batteries at any stage in charging cycle by measuring charging current and either gas evolution or electrode potential. Data then processed by microcomputer. Uses include cell voltage, cell pressure, cell temperature and rate of gas recombination on catalyst.

B83-10278
MEASURING SOFTWARE-EXECUTION TIME
C. PINERA (International Business Machines Corp.)
Apr. 1984
KSC-11267 **Vol. 8, No. 1, P. 27**
Test circuit times routines even during multiprogram operation. Circuit generates pulse started by signal at beginning address of program under test and ended by signal at ending address. Pulse duration measured with logic analyzer to determine execution time.

B83-10279
TELEMETRY SPEEDS FOREST-FIRE CONTROL
J. C. ARVESEN and J. W. CHERBONNEAUX
Apr. 1984
ARC-11438 **Vol. 8, No. 1, P. 28**
Airborne system rapidly delivers hard copy to firefighters. Sensors in airplane send data to ground station for image processing. Imagery immediately transferred to U.S. Geologic Survey (USGS) maps by photo interpreter. Maps transmitted by telecopies directly to fire-control camps. Receipt by fire camp less than 10 minutes. Information aids in decisions involving deployment of firefighters and equipment, flood control, monitoring oilspills, observing thermal currents, and pollutions monitoring.

B83-10280
DUAL-RATE TRANSMISSION REDUCES WEATHER EFFECTS
E. C. POSNER (CALTECH)
Apr. 1984
NPO-15807 **Vol. 8, No. 1, P. 29**
Scheme ensures maximum data received on average. Dual-rate scheme for maximizing data returned during spacecraft mission, adaptable, as is or with modifications, to high-frequency terrestrial data transmission. Data rate fixed in advance at minimum value guarantees reasonable prospect of success during bad weather. Dualrate strategy yields net data rate 2.5 times best achievable with single transmission rate.

B83-10281
CHARGE EFFICIENCY TESTS OF LEAD/ACID BATTERIES
J. J. ROWLETTE (CALTECH)
Apr. 1984
NPO-15869 **Vol. 8, No. 1, P. 29**
Current, voltage, and gas evolution measured during charge/discharge cycles. Series of standarized tests for evaluating charging efficiency of lead/acid storage batteries described in report. Purpose of tests to provide information for design of battery charger that allows maximum recharge efficiency for electric-vehicle batteries

consistent with other operating parameters, such as range, water loss, and cycle life.

B83-10282
EXTENDING THE MEMORY OF MICROCOMPUTERS
G. A. WIKER (CALTECH)
Apr. 1984
NPO-15295 **Vol. 8, No. 1, P. 30**
Memory increased while retaining real-time capabilities. Extra memory capacity added to microprocessor without increasing memory address length and special transfer instructions by dedicating block of space in main memory to hold addresses of locations in extra memory.

B83-10283
RADIO-FREQUENCY AND WIDEBAND MODULATION ARRAYING
M. H. BROCKMAN (CALTECH)
Apr. 1984
NPO-15030 **Vol. 8, No. 1, P. 30**
Summing network receives coherent signals from all receivers in array. Method sums narrow-band radio-frequency (RF) carrier powers and wide-band spectrum powers of array of separate antenna/receiver systems designed for phase-locked-loop or suppressed-carrier operation.

B83-10284
IMPROVED COAL-THICKNESS MEASUREMENT
T. A. BARR
Apr. 1984
MFS-23721 **Vol. 8, No. 1, P. 30**
Summed signals and dielectric-filled antenna improve measurement. Improved FM radar for measuring thickness of coal seam eliminates spectrum splitting and reduces magnitude of echo from front coal surface.

B83-10285
PULSE RESPONSE YIELDS BATTERY CHARGE STATE
C. P. CHAPMAN (CALTECH) and T. A. BARBER (CALTECH)
Apr. 1984
NPO-14882 **Vol. 8, No. 1, P. 31**
Response to input pulse characterizes state of charge of battery. Instrument electronically measures input and response of forcing-function pulse that periodically modulates charge or discharge current.

B83-10286
AUTOMATIC CONTROL OF MULTIMEDIA SHOWS
L. D. HOLLEY and J. P. STRODE
Apr. 1984
KSC-11080 **Vol. 8, No. 1, P. 31**
Audiovisual program synchronized digitally. Controller synchronizes over 60 events to two 16-millimeter movies regardless of speed variations in movie projectors.

B83-10287
DIGITAL SAR PROCESSOR
C. WU (CALTECH) and K. Y. LIU (CALTECH)
Apr. 1984
NPO-15519 **Vol. 8, No. 1, P. 31**
Produces real-time, single-look, high-resolution imagery. Digital synthetic-aperature-radar (SAR) processor achieves rate of 4 million samples per second. System combines frequency-domain and time-domain processing for two-dimensional azimuth correlation.

B83-10288
ELECTRIC-POWER SYSTEM SIMULATOR
R. W. CALDWELL (CALTECH), R. L. GRUMM (CALTECH), and B. L. BIEDEBACH (CALTECH)
Apr. 1984
NPO-15515 **Vol. 8, No. 1, P. 31**
Shows different combinations of generation, storage, and load components: display, video monitor with keyboard input to microprocessor, and video monitor for display of load curves and power generation. Planning tool for electric utilities, regulatory agencies, and laymen in understanding basics of electric-power systems operation.

B83-10289
CONNECTING SEPARATE COMPUTERS TO A COMMON BUS
A. K. AGRAWAN (CALTECH), P. G. MULLEN (CALTECH), and V. V. VADAKAN (CALTECH)
Apr. 1984
NPO-15433 **Vol. 8, No. 1, P. 31**
Network bus adapter (NBA) handles protocols for computer-tocomputer communications. NBA does all protocol handling and communications with bus for its host computer, that processor of different speeds sends data to each other continuously at maximum speed. Any host can communicate with any other, or several or with all.

B83-10290
FREQUENCY-DIVERSITY RECEPTION FOR PHASE MODULATION
M. H. BROCKMAN (CALTECH)
Apr. 1984
NPO-15040 **Vol. 8, No. 1, P. 32**
Signal-to-noise ratio improved. System receives phase modulation transmitted simultaneously on different carrier frequencies. Used for carriers received through different antennas or through same antenna.

B83-10291
ELIMINATING DOPPLER EFFECTS IN SYNTHETIC-APERTURE RADAR OPTICAL PROCESSORS
N. J. CONSTANTINDES (CALTECH) and T. J. BICKNELL (CALTECH)
Apr. 1984
NPO-14998 **Vol. 8, No. 1, P. 32**
Pair of photodetectors generates correction signals. Instrument detects Doppler shifts in radar and corrects processing parameters so ambiguities caused by shifts not manifested as double or overlapping images.

B83-10292
ELECTRONICALLY-SCANNED FOURIER-TRANSFORM SPECTROMETER
J. B. BRECKINRIDGE (CALTECH) and F. G. OCALLAGHAN (CALTECH)
Apr. 1984
NPO-15844 **Vol. 8, No. 1, P. 32**
Instrument efficient, lightweight, and stable. Fourier-transform spectrometer configuration uses electronic, instead of mechanical, scanning. Configuration insensitive to vibration-induced sampling errors introduced into mechanically scanned systems.

B83-10521
SELF-CHECKING MEMORY INTERFACE
M. W. SIEVERS (CALTECH) and D. A. RENNELS (CALTECH)
Nov. 1984
NPO-15889 **Vol. 8, No. 2, P. 179**
Memory-interface integrated circuit not only detects errors in data from other circuits but also detects errors within itself. Memory-interface chip encodes 16-bit words with Hamming code for single-error correction or double-error detection. Chip used in fault-tolerant computers under development by NASA.

B83-10522
SIDEBAND-AIDED RECEIVER ARRAYS
S. A. BUTMAN (CALTECH), L. J. DEUTSCH (CALTECH), and R. A. WINKELSTEIN (CALTECH)
Nov. 1984
NPO-15873 **Vol. 8, No. 2, P. 180**
Sideband-aided receiver arrays (SARA's) offer way of extracting greater energy per bit in radio data signals. 'Slave' receivers obtain modulation information from 'master'

receiver. Developed for reception of telemetry from vehicles in deep space, SARA concept applicable to commercial data-signal reception whenever two or more antennas are combined.

B83-10523
DETECTING DEFORMATIONS IN PHASED-ARRAY ANTENNAS
F. K. LI (CALTECH) and D. N. HELD (CALTECH)
Nov. 1984
NPO-15390 **Vol. 8, No. 2, P. 181**
Doppler technique detects deformation of large phased array radar antenna. Antenna electrically split into subarrays; individual phases measured when examination of antenna stability and provides information for correcting deformation.

B83-10524
AUTOMATIC PHASING FOR ACTIVE ANTENNA ELEMENTS
C. WU (CALTECH)
Nov. 1984
NPO-15920 **Vol. 8, No. 2, P. 182**
Automatic phasing system periodically interrupts antenna operation for calibration intervals and measures phase and amplitude response at each active antenna element. Using these measurements, system adjusts phase shift and possibly gain of active elements during operating intervals to give desired antenna-gain pattern.

B83-10525
INTERSTITIAL DIGITAL-IMAGE-POINT GENERATOR
T. R. EDWARDS
Nov. 1984
MFS-25871 **Vol. 8, No. 2, P. 183**
Resolution of digital imagery increased by calculating estimated values of intensity at coordinate points between original intensity-data points. Calculator implements algorithm that generates such interstitial points using four-by-four array of convolute integer coefficients. Coefficients multiplied by intensities at 16 original image points nearest each interstice to obtain weighted average intensity at each interstice.

B83-10526
UNMANNED INSTRUMENT PLATFORM FOR UNDERSEA EXPLORATION
G. PAINE (CALTECH), G. R. HANSEN (CALTECH), R. W. GULIZIA (CALTECH), and P. PALUZZI (CALTECH)
Nov. 1984
NPO-15878 **Vol. 8, No. 2, P. 184**
Instruments accommodated on moving underwater platform. Towable underwater platform 3.2 meters long, 1.2 meters wide, 1.4 meters high and has mass of about 1,250 kilogram. Platform remotely operated and unmanned. Serves as test bed for development of ocean-measuring instruments and sonars at depths to 20,000 feet.

B83-10527
ELIMINATING 'HOTSPOTS' IN DIGITAL IMAGE PROCESSING
P. M. SALOMON (CALTECH)
Nov. 1984
NPO-15684 **Vol. 8, No. 2, P. 185**
Signals from defective picture elements rejected. Image processing program for use with charge-coupled device (CCD) or other mosaic imager augmented with algorithm that compensates for common type of electronic defect. Algorithm prevents false interpretation of 'hotspots'. Used for robotics, image enhancement, image analysis and digital television.

B83-10528
DETECTION OF FLOATING INPUTS IN LOGIC CIRCUITS
B. CASH (Martin Marietta Corp.) and M. G. THORNTON (Martin Marietta Corp.)
Nov. 1984
LAR-13073 **Vol. 8, No. 2, P. 185**
Simple modification of oscilloscope probe allows easy detection of floating inputs or tristate outputs in digital-IC's. Oscilloscope probe easily modified with 1/4 W resistor and switch for detecting floating inputs in CMOS logic circuits.

B83-10529
DISPLAYING FORCE AND TORQUE OF A MANIPULATOR
A. K. BEJCZY (CALTECH), R. S. DOTSON (CALTECH), and H. C. PRIMUS (CALTECH)
Nov. 1984
NPO-15942 **Vol. 8, No. 2, P. 186**
Display combines bar charts, vector diagrams, and numerical values to inform operator of forces and torques exerted by end effector of manipulator. On voice or keyboard command, eight-channel strip-chart recorder traces force and torque components and claw position of raw measurements from eight strain gage sensors in end effector. Especially helpful when operator's view of end effector is obscured.

B83-10530
DITIGAL-IMAGE ENHANCEMENT
R. WOODS (University of Tennessee) and R. GONZALEZ (University of Tennessee)
Nov. 1984
MFS-25679 **Vol. 8, No. 2, P. 187**
Programable system enhances digitally monocular and stereographic images at video rates. Provides automatic and interactive enhancement modes based on histogram modification and intensity-mapping techniques.

B83-10531
INSTRUMENTATION AND CONTROL FOR FOSSIL-ENERGY PROCESSES
A. MARK JR. (CALTECH)
Nov. 1984
NPO-15581 **Vol. 8, No. 2, P. 187**
Instrumentation and control requirements for fossil-energy processes discussed in working document. Published to foster advancement of instrumentation and control technology by making equipment suppliers and others aware of specifications, needs, and potential markets.

B83-10532
STATUS PANEL FOR VIDEO CASSETTE RECORDERS
G. L. TALLEY JR. (Information Systems Directorate) and D. R. HERBISON (Information Systems Directorate)
Nov. 1984
KSC-11254 **Vol. 8, No. 2, P. 187**
Central array of light-emitting diodes displays status of 30 video cassette recorders (VCR's) monitoring integrated testing of Space Shuttle. Remote status panel linked to VCR's by one 37-conductor cable. Transistor/ transistor logic chips in interface circuit allow LED array to function without drawing power from VCR control circuits.

B83-10533
CENTRAL CONTROL OF LOCAL OSCILLATOR FREQUENCIES
S. F. SMITH (University of Tennessee)
Nov. 1984
GSC-12804 **Vol. 8, No. 2, P. 187**
Central unit automatically controls frequencies of group of independent crystal-controlled low-power oscillators. Unit checks its own frequency against accurate frequency reference, such as station WWV and corrects its own timing circuit as necessary.

B83-10534
DEALLOCATING DEFECTIVE SPACE ON WINCHESTER DISKS
W. KING JR. (IBM Corp.)
Nov. 1984
KSC-11287 **Vol. 8, No. 2, P. 188**
Method given for locating and deallocating defective

sectors or tracks in Winchester-disk system partitioned into two regions, one for each of two operating systems (OS). First is real-time (on-line) OS, second is diagnostic (off-line) OS.

B83-10535
DISPLAY FOR MINING-MACHINE OPERATORS
P. PAULSON (Adjunct Technologies, Inc.)
Nov. 1984
MFS-25955 **Vol. 8, No. 2, P. 188**

Electronic display unit provides operator of longwall shearer with information needed to control machine. Unit samples sensors on shearer. Using sensor signals, executes mathematical calculations, performs decisionmaking routines and displays results to operator. Unit also logs data for later analysis.

B83-10536
DETERMINING THE NONLINEARITY OF MICROWAVE RECEIVERS
C. T. STELZRIED (CALTECH) and J. E. OHLSON (CALTECH)
Nov. 1984
NPO-15355 **Vol. 8, No. 2, P. 188**

Nonlinearity of microwave receiver measured and automatically corrected for by noise-adding radiometer built into microwave receiving circuit. Radiometer includes noise-adding diode, turned on and off by computer controlled processor.

B83-10537
ESTIMATING EFFECTS OF FLICKER NOISE IN CLOCK SIGNALS
S. C. WU (CALTECH)
Nov. 1984
NPO-15525 **Vol. 8, No. 2, P. 188**

Two techniques mathematically estimate effects of flicker noise in pulse trains used as clock signals.

B83-10538
HARDWARE FAULT SIMULATOR GENERATES TEST VECTORS FOR COMPLEX IC'S
C. C. TIMOC (CALTECH), L. M. HESS (CALTECH), and F. R. STOTT (CALTECH)
Nov. 1984
NPO-15362 **Vol. 8, No. 2, P. 188**

Report describes technique using fault simulator implemented entirely in hardware to generate and optimize test vectors for microprocessor. Hardware fault simulator approach reduces test time, while maintaining high reliability in detecting faults.

03 PHYSICAL SCIENCES

B83-10019
FABRICATING GRATING COUPLERS ON OPTICAL FIBERS
C. R. CHUBB (McDonnell Douglas Corp.), J. K. POWERS (McDonnell Douglas Corp.), and D. A. BRYAN (McDonnell Douglas Corp.)
Aug. 1983
MSC-20286 **Vol. 7, No. 3, P. 263**

Microscopic corrugations form on fiber surfaces. Grating couplers couple signals into and out of single-mode optical waveguides without requiring precise alignment of components, although in-service efficiency has yet to be verified.

B83-10020
IMPROVED CATTLE HAULER
E. J. SALTZMAN
Aug. 1983
FRC-11058 **Vol. 7, No. 3, P. 265**

Better aerodynamics and ventilation increases fuel efficiency and decreases shipping losses. Trailer is ventilated and cooled by inlet ports in front of rig and outlet ports in middle and rear. Rounded cab and fairing reduce drag by creating an attached airflow.

B83-10021
CHARGED PARTICLE FLUX SENSOR
D. A. GREGORY and C. D. STOCKS
Aug. 1983
MFS-25461 **Vol. 7, No. 3, P. 265**

Improved version of Faraday cup increases accuracy of measurements of flux density of charged particles incident along axis through collection aperture. Geometry of cone-and-sensing cup combination assures most particles are trapped.

B83-10022
LENSELESS SCANNING TELESCOPE
H. B. EDWARDS
Aug. 1983
LAR-12648 **Vol. 7, No. 3, P. 266**

Dual-aperture device minimizes aliasing. Radiometer scans at right angles to line of flight, giving complete coverage from horizon to horizon. Configurations include use of detector as inner aperature or use of concentrating lens in or behind inner aperture to image outer aperture on smaller detector.

B83-10023
PRECISE MEASUREMENT OF EFFECTIVE FOCAL LENGTH
T. D. WISE (Hughes Aircraft Co.) and J. B. YOUNG (Hughes Aircraft Co.)
Aug. 1983
GSC-12745 **Vol. 7, No. 3, P. 267**

Computerized instrument measures effective focal lengths to 0.01 percent accuracy. Laser interferometers measure mirror angle and stage coordinate y in instrument for accurate measurment of focal properties of optical systems. Operates under computer control to measure effective focal length, focal surface shape, modulation transfer function, and astigmatism.

B83-10024
COOLING BY PARA-TO-ORTHO-HYDROGEN CONVERSION
A. SHERMAN and T. NAST (Lockheed Corp.)
Aug. 1983
GSC-12770 **Vol. 7, No. 3, P. 268**

Catalyst speeds conversion, increasing capacity of solid hydrogen cooling system. In radial-flow catalytic converter, para-hydrogen is converted to equilibrium mixture of para-hydrogen and ortho-hydrogen as it passes through porous cylinder of catalyst. Addition of catalyst increases capacity of hydrogen sublimation cooling systems for radiation detectors.

B83-10025
SUBMILLISECOND OPTICAL KNIFE-EDGE TESTING
P. THURLOW (Hughes Aircraft Co.)
Aug. 1983
GSC-12740 **Vol. 7, No. 3, P. 269**

Fast computer-controlled sampling of optical knife-edge response (KER) signal increases accuracy of optical system aberration measurement. Submicrosecond-response detectors in optical focal plane convert optical signals to electrical signals converted to digital data, sampled and feed into computer for storage and subsequent analysis. Optical data are virtually free of effects of index-of-refraction gradients.

B83-10026
DETERMINING THE POINT OF ZERO ZETA POTENTIAL IN SOLID SAMPLES
C. E. BYVIK and B. REICHMAN (Christopher Newport College)
Aug. 1983
LAR-12893 **Vol. 7, No. 3, P. 270**

Technique for measuring pzzp in solid samples incorporates sample in photochemical cell and measures temperature dependence of flatband potential. Pzzp is obtained from slope of best straight line through measured points. Tests agree well with expected values. In technique sample does not have to be in powder form.

B83-10027
VIEWER MAKES RADIOACTIVITY 'VISIBLE'
L. I. YIN
Aug. 1983
GSC-12640 **Vol. 7, No. 3, P. 271**

Battery operated viewer demonstrates feasibility of generating threedimensional visible light simulations of objects that emit X-ray or gamma rays. Ray paths are traced for two pinhold positions to show location of reconstructed image. Images formed by pinholes are converted to intensified visible-light images. Applications range from radioactivity contamination surveys to monitoring radioisotope absorption in tumors.

B83-10028
BEAM SPLITTER INTRODUCES LITTLE ABERRATION
N. L. EVANS JR. (CALTECH)
Aug. 1983
NPO-15580 **Vol. 7, No. 3, P. 2,**

Placing beam splitter inside existing lens minimizes aberrations. Six channel beam splitter has optical paths of lengths equal to distances traveled by rays. Lens element cemented to each of exit faces of beam splitter is optically concentric with element cemented to entrance face and with center of curvature of monocentric optical system. Beam splitter makes it possible to form separate image in each wavelength channel of interest.

B83-10029
OPTICAL-FIBER-TO-CHANNEL-WAVEGUIDE COUPLER
G. O. RAMER (Hughes Aircraft Co.)
Aug. 1983
NPO-15555 **Vol. 7, No. 3, P. 273**

Holding device made by etching V-shaped grooves in silicon in coupler close tolerances are achieved for high-efficiency coupling between optical fibers with core diameter of 5 um and 110 um in cross section. Fibers are held in V-shaped grooves on silicon chips.

B83-10030
CONTROLLING INDUSTRIAL NOISE
Innovator Not Given(The Bionetics Corp.) Aug. 1983 See Also NASA SP-5108 (N82-11858/NSP)
LAR-13001 **Vol. 7, No. 3, P. 273**

Handbook gives basic comprehensive information on noise in industrial environments. Intended to aid engineers in understanding measuring and controlling noise whether or not they have experiences in acoustics.

B83-10140
ACOUSTIC EMISSIONS REVEAL COMBUSTION CONDITIONS
D. N. R. RAMOHALLI (Caltech) and P. K. SESHAN (Caltech)
Oct. 1983
NPO-15699 **Vol. 7, No. 4, P. 389**

Turbulent-flame acoustic emissions change with air/fuel ratio variations. Acoustic emissions sensed and processed to detect inefficient operation; control system responds by adjusting fuel/air mixture for greater efficiency. Useful for diagnosis of combustion processes and fuel/air control.

B83-10141
ELECTRON BEAM COULD PROBE RECOMBINATION CENTERS
O. VONROOS (CALTECH)
Oct. 1983
NPO-15285 **Vol. 7, No. 4, P. 390**

Electron beam probe technique estimate electron/hole capture cross sections in semiconductors with wide band gaps. Amplitude-modulated electron beam induces short-circuit current collected by ohmic contacts. Phase shift between this current and electron-beam current measured as function of frequency. Results of measurements used to ascertain recombination rates and energy levels.

B83-10142
SELF-MODULATED LASER RANGEFINDER
J. B. ABSHIRE
Oct. 1983
GSC-12761 **Vol. 7, No. 4, P. 391**

Longitudinal resonance modes exploited. Self-modulated-laser ranging system exploits presence of signals differing in frequency by longitudinalmode separation frequency fm. Two square-law photodetectors have outputs modulated by fm, and phase difference between two outputs is related to target distance. Laser transmitter/receiver measures distances as well as displacements of distant objects (such as vibrating buildings).

B83-10143
PYRHELIOMETER WITH IMPROVED ACCURACY
R. S. ESTEY (CALTECH) and M. F. HANNA (CALTECH)
Oct. 1983
NPO-15398 **Vol. 7, No. 4, P. 393**

Instrument maintains components at constant temperature and allows tenfold improvement in instrumental accuracy. Two units make up improved pyreheliometer. Radiometer absorbs radiant energy and generates electrical signal. Control unit, which incorporates improvements, provides amplifiers, controls, and calibration circuits. Instrument 10 times more accurate than previous sion.

B83-10144
ESTIMATING WAVEGUIDE FEED DIRECTIVITY AND SPACING
Y. RAHMAT-SAMII (CALTECH), P. W. CRAMER (CALTECH), K. E. WOO (CALTECH), and S. W. LEE (CALTECH)
Oct. 1983
NPO-15603 **Vol. 7, No. 4, P. 393**

Approximate curves simplify initial steps of antenna design. Maximum achievable directivity exponents plotted as functions of element spacing in wavelengths for equilateral triangular array of rectangular waveguides. Directivities and exponents calculated for circular waveguides, pyramidal horns, and other standard feeds. Designer quickly estimates element spacing necessary to achieve required directivity or directivity achievable.

B83-10145
NORMAL-INCIDENCE SOFT-X-RAY MIRROR
J. H. UNDERWOOD (CALTECH) and T. W. BARBEE JR. (Stanford)
Oct. 1983
NPO-15828 **Vol. 7, No. 4, P. 394**

Multilayered interference structure has about 6 percent reflectivity. Normal-incidence X-Ray Mirror, bent into spherical surface of radius 1.1mm used to image electroformed-nickel grid onto photographic film sensitive to soft X-rays. Grid set at distance of 1,067 mm from mirror, illuminated by simple Coolidge-type X-ray tube with carbon anode operated from 1.5KV supply. Film set at distance of 1,186 mm from mirror with resultant magnification of 1.11.

B83-10146
MULTISPECTRAL DUAL-APERTURE SCHMIDT OBJECTIVE
P. O. MINOTT

Oct. 1983
GSC-12756 **Vol. 7, No. 4, P. 395**

Off-axis focal planes make room for beam splitters. System includes two off-axis primary spherical reflectors, each concentric with refractive corrector at aperature. Off-axis design assures large aperture required for adequate spatial resolution. Separate images have precise registration, used for multispectral resource mapping or remote sensing.

B83-10147
GRATING DEMULTIPLEXERS FOR OPTICAL SIGNALS
E. MAROM (Hughes Aircraft Co.) and O. G. RAMER (Hughes Aircraft Co.)
Oct. 1983
LAR-12748 AND LAR-12749 **Vol. 7, No. 4, P. 397**

Two systems proposed to increase wavelength resolution. Two paraboloidal reflectors and grating separate light into component colors. First paraboloid forms input light into nearly planar waves. Reflected from planar grating at various angles depending on wavelength. Second paraboloid focuses separate wavelengths to separate lines.

B83-10148
FUSE PROTECTS PARABOLIC-DISH SOLAR COLLECTOR
M. K. SELCUK (Caltech)
Oct. 1983
NPO-15662 **Vol. 7, No. 4, P. 397**

Sliding barrel and shutter protect against overheating. Downward movement of shutter initiated by melting of fuse wire that suspends it. Shutter lowered or raised under operator's control by depressuring or pressurizing hydraulic cylinder.

B83-10149
COST EFFECTIVENESS OF HYBRID SOLAR POWERPLANTS
L. C. WEN (Caltech) and H. L. STEELE (Caltech)
Oct. 1983
NPO-15735 **Vol. 7, No. 4, P. 398**

Report discusses cost effectiveness of high-temperature thermal storage system for representative parabolic dish solar powerplant. Economic viability of thermal storage system assesses; cost and performance projections made; cost of electricity generated by solar power plant also calculated.

B83-10150
SOLAR-POND RESOURCES IN THE UNITED STATES
M. G. HURICK (Caltech)
Oct. 1983
NPO-15681 **Vol. 7, No. 4, P. 398**

Report describes survey of U.S. salt and brine deposits providing essential information for developers considering use of solar ponds for heat and electricity production. Sites classified as areas of ponds about 1 km2, or larger, accommodated in which salt, clay, and water are available.

B83-10293
COMPACT CONCENTRATORS FOR SOLAR CELLS
V. S. WHANG (TRW, Inc.)
Apr. 1984
MFS-25511 **Vol. 8, No. 1, P. 35**

Each cell in array has own concentrator. A Cassegrain Reflector combination of paraboloidal and hyperboloidar mirrors-used with conical reflector at each element of array. Three components direct light to small solar cell. No cooling fins, fans, pumps, or heat pipes needed, not even in vacuum.

B83-10294
TESTING LARGE SOLAR MIRRORS
M. J. ARGOUD (CALTECH), W. L. WALKER (CALTECH), R. S. LELAND (CALTECH), L. V. BUTLER (CALTECH), and E. W. DENNISON (CALTECH)
Apr. 1984
NPO-15404 **Vol. 8, No. 1, P. 36**

Mirror figure evaluated in terms of imaging properties. Equipment includes scanner for measuring irradiance distribution in solar image produced by gore and camera equipped with special aperatures for determining magnitude and location of figure errors on gores.

B83-10295
TWO-STAGE OFF-AXIS CYLINDRICAL SOLAR CONCENTRATOR
R. WINSTON (University of Chicago), J. J. OGALLAGHER (University of Chicago), W. T. WELFORD (University of London), and D. E. ROCKEY (CALTECH)
Apr. 1984
NPO-15484 **Vol. 8, No. 1, P. 37**

Concentrator uses off-axis geometry to achieve efficient uniform illumination of photovoltaic cells. Primary reflector is parabolic cylinder and therefore readily adaptable to rolling up for transport and unrolling for deployment. Foldable cylindrical structure has potiential for both terrestrial and space applications.

B83-10296
CONTACTLESS MEASUREMENT OF PHYSICAL PROPERTIES
D. D. ELLEMAN (CALTECH), T. G. WANG (CALTECH), E. H. TRINH (CALTECH), and A. CROONQUIST (CALTECH)
Apr. 1984
NPO-15839 **Vol. 8, No. 1, P. 38**

Surface tension and other properties determined from measurement of resonant frequency. Surface tension and other physical properties of molten and liquid samples excited at resonance measured by observing photographic or TV image and noting resonant frequency and rate of change. Technique used in normal gravity and low gravity in either vacuum or gaseous environment, where sample is positioned by electrostatic, acoustic, or magnetic forces.

B83-10297
DRYING MILK WITH BOILER EXHAUST
M. R. BROUSSARD (CALTECH)
Apr. 1984
NPO-15923 **Vol. 8, No. 1, P. 39**

Considerable energy saved in powdered-milk industry. Only special requirement boiler fired with natural gas or other clean fuel. Boiler flue gas fed to spray drier where it directly contacts product to be dried. Additional heat supplied by auxillary combustor when boiler output is low. Approach adaptable to existing plants with minimal investment because most already equipped with natural-gas-fired boilers.

B83-10298
HYDROGEN MASERS AS TIME AND FREQUENCY STANDARDS
S. C. WARD (CALTECH)
Apr. 1984
NPO-15858 **Vol. 8, No.1, P. 39**

Track each other with 100 times more precision than cesium standards. Geographically separated hydrogen masers tracked each other for more than year to within few parts in 10 to the 15th power. Frequency offset of hydrogen-maser output from hyperfine line frequency is function of ambient magnetic field, cavity mistuning, thermal motion of atoms in cavity and collisions of atoms with walls of the cavity. If maser remains at one location some of small offsets in frequency will remain constant throughout life of maser.

B83-10299
FLUID/VAPOR SEPARATOR FOR VARIABLE FLOW RATES
J. M. LEE (UCLA), C. CHUANG (UCLA), T. H. FREDERKING (UCLA), G. S. BROWN (UCLA), Y. KAMIOKA (UCLA), and J. VORREITER
Apr. 1984
ARC-11401 **Vol. 8, No. 1, P. 40**

Shutter varies gas throughput of porous plug. Variable

area exposed on porous plug allows to pass varying rates of vapor flow while blocking flow of liquid helium II from cryogenic bath. Applications in refining operations, industrial chemistry, and steam-powered equipment.

B83-10300
COMPUTATION OF BRAGG REFLECTION FOR LAYERED MICROSTRUCTURES
J. W. UNDERWOOD (CALTECH) and T. W. BARBEE (CALTECH)
Apr. 1984
NPO-15880 **Vol. 8, No. 1, P. 41**
Bragg diffractors analyzed for use in X-ray mirrors and other applications. SLM tailored to specific applications by varying layer thicknesses and number of layers to control reflectivity diffraction width, and wavelength resolution. Applications as glancing incidence mirrors or filters for wavelengths of few to few hundred angstroms.

B83-10301
HOLOGRAPHIC TWYMAN-GREEN INTERFEROMETER
C. W. CHEN (CALTECH), J. C. WYANT (CALTECH), and J. B. BRECKINRIDGE (CALTECH)
Apr. 1984
NPO-15754 **Vol. 8, No. 1, P. 42**
Off-axis Fresnel zone plate used to obtain fringe visibility close to unity. Holographic Twyman-Green Interferometer (HTG) employs off-axis Fresnel zone plate (OFZP) as beam splitter and beam diverger in place of two separate elements that perform those functions in conventional Twyman-Green interferometer.

B83-10302
IMPROVED ELECTROSTATIC OPTICAL SYSTEM
B. F. LEWIS (CALTECH)
Apr. 1984
NPO-15774 **Vol. 8, No. 1, P. 43**
Device suitable for molecular epitaxial formation of semiconductor components. Improved electrostatic lens system uses cylindrical mirror as central element between two tubular lenses. Abberations introduced by mirror tend to cancel those introduced by tubular lenses. Result is order-of-magnitude improvement in chromatic or spherical compensation.

B83-10303
LEAST-SQUARES PREDICTION OF SOLAR ACTIVITY
R. L. HOLLAND, C. RHODES, and H. C. EULER JR.
Apr. 1984 See Also NASA TM-8242 (N82-27221/NSP)
MFS-25870 **Vol. 8, No. 1, P. 44**
Studies of statistical methods for predicting future solar activity described in report containing extensive graphical and tabular presentations of analyses. Lagranglan-least-squares method, which gives best predictions presented in detail. FORTRAN source code for method given.

B83-10304
SOLAR HEATING AND COOLING DEVELOPMENT PROGRAM
R. AAEN (Honeywell Technology Strategy Center) and A. GOSSLER (Honeywell Technology Strategy Center)
Apr. 1984
MFS-27015 **Vol. 8, No. 1, P. 44**
Heating is practical now, but cooling needs more development. Report describes program for design and development of solar heating and cooling systems having high performance, low cost and modular application. Describes main technical features of each of systems. Presents summary of performance and costs.

B83-10305
DESIGNING FLAT-PLATE PHOTOVOLTAIC ARRAYS
R. G. ROSS JR. (CALTECH)
Apr. 1984
NPO-15729 **Vol. 8, No. 1, P. 45**
Report presents overview of state of art in design techniques for flat-plate solar photovoltaic modules and arrays. Paper discusses design requirements, design analyses, and test methods identified and developed for this technology over past several years in effort to reduce cost and improve utility and reliability for broad spectrum of terrestrial applications.

B83-10306
MULTIPLE-WAVELENGTH METAL/HALIDE LASER
N. M. NERHEIM (CALTECH)
Apr. 1984
NPO-15256 **Vol. 8, No. 1, P. 45**
Single device produces multiple lasing lines. Laser capable of producing many lasing lines has several reservoirs of halide lasant mixed with chlorides of copper, manganese and iron. Convection-control technique possible to rapidly change from one metal halide to another at maximum energy.

B83-10307
SCANNING XECL LASER
J. B. LAUDENSLAGER (CALTECH), T. J. PACALA (CALTECH), and I. S. MCDERMID (CALTECH)
Apr. 1984
NPO-15692 **Vol. 8, No. 1, P. 45**
Applications of narrow-bandwith laser include remote sensing and high-resolution spectroscopy. Scanning XeCl oscillator/ring-laser amplifier produces narrow spectral bandwidth (less than 0.003nm) over tuning range of 307.5 to 308.5 nm. Ring configuration has following advantages: oscillator decoupled from amplifier, output unidirectional, output beam uniform and inexpensive optics allow variable output coupling and cavity length.

B83-10308
SIMPLIFIED LASER TUNING
I. S. MCDERMID (CALTECH) and T. J. PACALA (CALTECH)
Apr. 1984
NPO-15690 **Vol. 8, No. 1, P. 45**
Tuning arrangement employs single grating and two planar mirrors. Arrangement of front-surface mirrors and single holographic grating significantly reduces spectral bandwidth and simplified tuning of laser output. Laser used to induce fluorescence in measuring concentrations of trace species, such as OH radical, in atmosphere.

B83-10309
OBTAINING PULSES FROM A CW LASER
J. S. MARGOLIS (CALTECH)
Apr. 1984
NPO-15111 **Vol. 8, No. 1, P. 46**
Two acousto-optic modulators operate in tandem. System generates pulses from output of continuous wave laser. Duration and repetition rate of pulses controlled.

B83-10310
CONTROLLING METAL-HALIDE VAPOR DENSITY IN LASERS
T. J. PIVIROTTO (CALTECH)
Apr. 1984
NPO-15021 **Vol. 8, No. 1, P. 46**
Streams of buffer gas convect and dilute metal-halide vapor. Technique uses flow of buffer gas through reservoir, which contains heated metal halide, to convect vapors into discharge tube. Second stream of buffer gas dilutes vapor. Final vapor density in laser tube controlled and changed by adjusting either one or both of buffer gas flow rates.

B83-10311
FLUORINE MIXER/VAPORIZER FOR CHEMICAL LASERS
A. GIANDOMENICO (CALTECH)
Apr. 1984
NPO-15552 **Vol. 8, No. 1, P. 46**
A mixer/vaporized chamber gasifies liquid fluorine before

It is injected into lasing cavity of hydrogen fluoride/deuterium fluoride laser. Flourine vaporized by flow of helium.

B83-10312
IMPROVED LASER VELOCIMETER
L. O. HEFLINGER (TRW, Inc.)
Apr. 1984
MFS-25465 **Vol. 8, No. 1, P. 46**
Self-alining laser velocimeter uses simple lenses and Dopplerfrequency shift by scattering disk to monitor fluid motion in three dimensions.

B83-10313
SOLAR-COLLECTOR RADIOMETER
J. M. KENDALL SR. (CALTECH)
Apr. 1984
NPO-14986 **Vol. 8, No. 1, P. 46**
Water-cooled Kendall radiometer measures output of solar energy concentrators. Unit measures irradiance up to 30,000 solar constants with 1 percent accuracy and responds to wavelengths from ultraviolet to far infrared.

B83-10314
CERAMIC SOLAR RECEIVER
C. ROBERTSON JR. (General Electric Co.)
Apr. 1984
NPO-15769 **Vol. 8, No. 1, P. 46**
Solar receiver uses ceramic honeycomb matrix to absorb heat from Sun and transfer it to working fluid at temperatures of 1,095 degrees and 1,650 degrees C. Drives gas turbine engine or provides heat for industrial processes.

B83-10315
BRICKS AND CANS FOR THERMAL STORAGE
H. SAHA (Alabama A & M University)
Apr. 1984
MFS-25625 **Vol. 8, No. 1, P. 47**
Water-filled cans and bricks provide efficient thermal storage for solar space and hot-water heating. Tests indicate thermal storage mediums suitable in both passive and active solar heating systems.

B83-10316
TWO-FLUID SOLAR POND
F. L. LANSING (CALTECH)
Apr. 1984
NPO-15419 **Vol. 8, No. 1, P. 47**
Plastic covered solar pond uses two immiscible liquids of different densities to collect and store solar energy.

B83-10317
EFFECTS OF OUTDOOR SOILING ON PHOTOVOLTAIC MODULES
A. R. HOFFMAN (CALTECH) and C. R. MAAG JR. (CALTECH)
Apr. 1984
NPO-15186 **Vol. 8, No. 1, P. 47**
Airborne contaminants degrade module performances. Report describes experiments to understand effects of airborne contaminants on sensitive surfaces of photovoltaic modules.

B83-10318
EFFECT OF TEMPERATURE ON FIBER-OPTIC DELAY
L. A. BERGMAN (CALTECH), S. T. ENG (CALTECH), A. R. JOHNSTON (CALTECH), and G. F. LUTES (CALTECH)
Apr. 1984
NPO-15148 **Vol. 8, No. 1, P. 47**
Fiber/jacket interactions affect performance. Attenuation and phase measurements made to assess effect of temperature on signal delay and attenuation in two fiber-optic cable samples.

B83-10319
STABILIZING FIBER-OPTIC TRANSMISSION LINES
G. F. LUTES (CALTECH) and K. Y. LAU (CALTECH)
Apr. 1984
NPO-15036 **Vol. 8, No. 1, P. 47**
Voltage-controlled optical phase shifter is key. Optical phase shifter stabilizes propagation delay of fiber-optic transmission line by compensating for temperature and pressure effects. Applicable to phased array antenna systems and very-long-baseline interferometer distribution systems.

B83-10320
IONIC REFRIGERATOR
R. RICHTER (CALTECH)
Apr. 1984
NPO-15288 **Vol. 8, No. 1, P. 48**
With no moving parts, proposed refrigerator has long life. Thermal energy of refrigeration process transported by hydrogen ions that go through three phase changes in absorbing heat and three phase changes in dissipating heat.

B83-10321
ESTIMATING THE SOLUBILITY OF GASES IN BATTERY ELECTROLYTES
D. D. LAWSON (CALTECH) and H. A. FRANK (CALTECH)
Apr. 1984
NPO-15610 **Vol. 8, No. 1, P. 48**
Estimates in excellent agreement with experimental values. Simple method proposed for estimating solubility of gases in electrolytes of lithium batteries using expressions for energy of vaporization and for molar volume.

B83-10322
EVAPORATION TOWER WITH PRILL NOZZLES
E. R. DU FRESNE (CALTECH)
Apr. 1984
NPO-15609 **Vol. 8, No. 1, P. 48**
Tower more efficient than conventional evaporation equipment. Liquids such as milk and fruit juice concentrated by passing them through tiny nozzle to form droplets, then allowing droplets to fall through evacuated tower with cooled walls.

B83-10323
ACCELERATED SOLAR-UV TEST CHAMBER
A. GUPTA (CALTECH) and E. G. LAUE (CALTECH)
Apr. 1984
NPO-15063 **Vol. 8, No. 1, P. 48**
Medium-pressure mercury-vapor lamps provide high ratio of ultraviolet to total power. Chamber for evaluating solar-ultraviolet (UV) radiation damage permits accelerated testing without overheating test specimens.

B83-10324
IMAGING BUBBLE FORMATION IN A DROP TUBE
R. HELIZON (CALTECH) and M. C. LEE (CALTECH)
Apr. 1984
NPO-15114 **Vol. 8, No. 1, P. 48**
Entire process under control of computer. Computer-controlled image-acquisition system tracks object, such as water bubble, as it moves in drop tube. Ultimately, such tracking system used to observe fusion-pellet formation in drop furnace.

B83-10325
MICROWAVE RADIATION DETECTOR
J. R. LESH (CALTECH)
Apr. 1984
NPO-15932 **Vol. 8, No. 1, P. 48**
Direct photon detector responds to microwave frequencies. Method based on trapped-ion frequency-generation standards proposed to detect radio-frequency (RF) radiation at 40.5 GHz. Technique used for directdetection (RF) communication, radar, and radio astronomy.

B83-10539
IMPROVED GAMMA-AND X-RAY PINHOLE CAMERA
L. I. YIN

Nov. 1984
GSC-12851 **Vol. 8, No. 2, P. 191**
Electronic additions increase image quality. Digital image-processing equipment electronically performs functions of S1 and D2 improving resolution and adding capability for image storage and further processing. System useful in nuclear medicine or radioisotope imaging, tomography and nuclear industry.

B83-10540
ION ACCELERATOR MERGES SEVERAL BEAMS
G. ASTON (CALTECH)
Nov. 1984
NPO-15547 **Vol. 8, No. 2, P. 192**
Intense ion beam formed by merging multiple ion beamlets into one concentrated beam. Beamlet holes in graphite screen and focusing grids arranged in hexagonal pattern. Merged beam passes through single hole in each of aluminum accelerator and decelerator grids. Ion extraction efficiency, beam intensity, and focusing improved.

B83-10541
NEUTRON PROBE OF BUILDING-WALL COMPOSITION
J. I. TROMBKA and L. G. EVANS (Computer Sciences Corp.)
Nov. 1984
GSC-12808 **Vol. 8, No. 2, P. 193**
Walls of historic buildings charted by neutron radiography. Neutron source and Gamma-Ray Detector alined with each other yield map of composition of wall. Points spaced for minimal overlap based on mean free path of gamma rays emitted from wall materials. Map indicates nature and extent of changes in building materials so proper treatment is applied.

B83-10542
COLLECTING LIGHT FROM POINT IMAGES
W. C. GOSS (CALTECH), E. F. TUBBS (CALTECH), and J. G. COHEN (CALTECH)
Nov. 1984
NPO-15887 **Vol. 8, No. 2, P. 194**
Light from sources at varying positions brought to fixed opening. In telescope field divided into 10 strips, 10 pairs of optical fibers moved laterally and longitudinally to any required position in their assigned strips. Fixed ends of fibers arrayed in line at spectrograph entrance slit. Concept developed to enhance efficiency of spectrographs on astronomical telescopes.

B83-10543
IMAGING FLUID FLOW
W. K. WITHEROW
Nov. 1984
MFS-25897 **Vol. 8, No. 2, P. 195**
Electro-optical system allows simultaneous viewing of schlieren, shadowgraph and interferometric images of volume of fluid under test. In imaging system cube beam splitters replaced by plate-type beam splitters or pellicle beam splitters.

B83-10544
VISUAL ALINEMENT TECHNIQUE FOR INFRARED LIDAR
R. T. MENZIES (CALTECH) and U. P. OPPENHEIM (CALTECH)
Nov. 1984
NPO-15826 **Vol. 8, No. 2, P. 196**
Visible He/Ne laser beam substituted for invisible CO_2 beam during alinement. System accomplished visually by using low-power He/Ne laser previously adjusted to visible beam parallel to invisible infrared CO_2 laser beam. Method used to aline adjacent telescopes in other optical systems.

B83-10545
AIRFLOW ASSISTS SOLAR RECEIVER
W. R. REVERE (CALTECH) and E. A. LAUMANN (CALTECH)
Nov. 1984
NPO-15784 **Vol. 8, No. 2, P. 196**
Heat loss by convection reduced. Simplified solar receiver concept involves inwardly directed flow of cooling air and 'air door' to reduce loss by convection. Receiver is constructed from inexpensive materials.

B83-10546
SUN TRACKER OPERATES A YEAR BETWEEN CALIBRATIONS
C. M. BERDAHL (CALTECH)
Nov. 1984
NPO-15810 **Vol. 8, No. 2, P. 197**
Low-cost modification of Sun tracker automatically compensates equation of time and seasonal variations in declination of Sun. Output of Scotch Yoke drive mechanism adjusted through proper sizing of crank, yoke and other components and through choice of gear ratios to approximate seasonal north and south motion of Sun. Used for industrial solar-energy monitoring and in remote meteorological stations.

B83-10547
ACOUSTIC IMAGING OF COMBUSTION NOISE
K. N. RAMOHALLI (CALTECH) and P. K. SESHAN (CALTECH)
Dec. 1984
NPO-15698 **Vol. 8, No. 2, P. 198**
Elliposidal acoustic mirror used to measure sound emitted at discrete points in burning turbulent jets. Mirror deemphasizes sources close to target source and excludes sources far from target. At acoustic frequency of 20 kHz, mirror resolves sound from region 1.25 cm wide. Currently used by NASA for research on jet flames. Produces clearly identifiable and measurable variation of acoustic spectral intensities along length of flame. Utilized in variety of monitoring or control systems involving flames or other reacting flows.

B83-10548
ION ENGINE WITH SOLID-ELECTROLYTE ION GENERATOR
R. RICHTER (CALTECH)
Nov. 1984
NPO-15809 **Vol. 8, No. 2, P. 199**
Working fluid utilized efficiently. Working fluid positive ions conducted through solid electrolyte to outside, then accelerated in external electric field. While in solid-electrolyte material, ions do not recombine with electrons: transported to surface with high ionization efficiency. Provides new way to generate beam of ions for implantation in semiconductors or other applications.

B83-10549
AIR-CONDITIONING FOR ELECTRIC VEHICLES
Z. POPINSKI (CALTECH)
Nov. 1984
NPO-15183 **Vol. 8, No. 2, P. 199**
Combination of ammonia-absorption refrigerator, roof-mounted solar collectors, and 200 degrees C service electric-vehicle motor provides evaporative space-heating/space cooling system for electric-powered and hybrid fuel/electric vehicles.

B83-10550
CONTROLLING TV-CAMERA F-STOP REMOTELY
G. L. TALLEY JR., D. R. HERBISON, and G. F. ROUTH
Nov. 1984
KSC-11269 **Vol. 8, No. 2, P. 200**
Lens opening of television camera controlled manually from remote location by simple and inexpensive data link without modifications to camera lens system. Allows closeup views of wide-brightness-range events otherwise hazardous for human operator.

B83-10551
HIGH-RESOLUTION X-RAY TELESCOPE

J. M. DAVIS (American Science & Engineering, Inc.), R. C. CHASE (American Science & Engineering, Inc.), and J. H. UNDERWOOD (CALTECH)
Nov. 1984
NPO-15971 **Vol. 8, No. 2, P. 200**
X-ray telescope for mapping celestial X-ray sources from locations in space uses secondary mirror to magnify images formed by primary mirror. Secondary mirror with hyperboloid/ hyperboloid surface located at focal plane of primary mirror.

B83-10552
IMPROVED INFRARED MULTISPECTRAL SCANNER
C. G. STANICH (Daedalus Enterprises, Inc.) and F. G. OSTERWISCH (Daedalus Enterprises, Inc.)
Nov. 1984
NPO-16143 **Vol. 8, No. 2, P. 200**
Spectrometer scan head redesigned to accommodate larger spectrometer and two blackbody reference sources while remaining within space limitations of its aircraft mounting.

B83-10553
LENSLESS IMAGE SCANNER
R. A. SCHINDLER (CALTECH)
Nov. 1984
NPO-16004 **Vol. 8, No. 2, P. 200**
Image scanner uses moving and stationary parallel slits to produce pictures of visible, infrared, X-ray microwave, or acoustic sources. No lenses or mirrors required. Single detector views all parts of image simultaneously rather than raster making relatively-short exposure times possible. Potential applications of system include medical x-ray imaging.

B83-10554
OPTICAL MEASUREMENT OF PARTICLE SIZE AND VELOCITY
J. L. SMITH
Nov. 1984
MFS-27036 **Vol. 8, No. 2, P. 200**
Dual-beam laser-Doppler anemometers simultaneously determine velocity and size distribution of particles in flowing fluid.

B83-10555
IMPROVED HOLLOW CATHODE
G. ASTON (CALTECH)
Nov. 1984
NPO-15560 **Vol. 8, No. 2, P. 200**
Improved hollow cathode for neutral-beam injector ion sources rapidly started by dielectric breakdown of ignitor plug located at one end of open ended tube. Used in low-current ion implantation, milling, sputtering, and bombardment for surface treatment.

B83-10556
CATALOG OF SPECTRAL LINES
R. L. POYNTER (CALTECH) and H. M. PICKETT (CALTECH)
Nov. 1984
NPO-15181 **Vol. 8, No. 2, P. 201**
Report describes computer accessible catalog of calculated and experimental spectral lines in frequency range between zero and 300 GHz for selected molecules, including chlorine oxide, bromine oxide, phosphine and oxygen.

B83-10557
LASER-BEAM SEPARATOR
I. S. MCDERMID (CALTECH)
Nov. 1984
NPO-15723 **Vol. 8, No. 2, P. 201**
Train of prisms and optical stop separate fundamental beam of laser from second and higher order harmonics of beam produced in certain crystals and by stimulated Raman scattering in gases and liquids.

B83-10558
MEASURING DELAY IN LASERS
L. A. BERGMAN (CALTECH) and E. T. SVERRE (CALTECH)
Nov. 1984
NPO-15242 **Vol. 8, No. 2, P. 201**
Technique measures delay, i.e., response time of modulated diode laser as function of temperature by comparing excitation signal to laser output signal with vector voltmeter.

B83-10559
LASER DIODE SCHLIEREN PHOTOGRAPHY
J. M. FRANKE and A. W. BURNER JR.
Nov. 1984
LAR-12897 **Vol. 8, No. 2, P. 201**
Laser diodes preferable to conventional lasers or incandescent lamps for Schlieren flow analysis because they are smaller, more rugged, less costly and have lower power requirements.

B83-10560
IMPROVED HEAT-ENGINE SOLAR-ENERGY SYSTEM
D. C. MILLER (CALTECH)
Nov. 1984
NPO-15762 **Vol. 8, No. 2, P. 201**
Heat engine solar-energy system improved by installing overcapacity heat exchanger and buffer loop between engine fluid and solar heated fluid.

B83-10561
PREDICTING SOLAR DEFICITS
R. G. ROSS JR. (CALTECH) and C. C. GONZALEZ (CALTECH)
Nov. 1984
NPO-15667 **Vol. 8, No. 2, P. 201**
Statistical method uses available long term solar irradiance data at selected sites in United States to predict probable deviations from long term monthly averages. Technique useful in sizing solar collectors and backup storage systems to cover solar deficits.

B83-10562
MODELING OF SOLAR CONCENTRATORS
D. E. ROCKEY (CALTECH)
Nov. 1984
NPO-15034 **Vol. 8, No. 2, P. 201**
Algorithm developed for predicting power output, uniformity of intensity and operating temperature of concentrator-enhanced photovoltaic solar cell arrays. Optimum values for parameters such as reflector geometry found prior to constructing scale models for testing.

B83-10563
SALTLESS SOLAR PONDS
E. I. LIN (CALTECH)
Nov. 1984
NPO-15808 **Vol. 8, No. 2, P. 202**
Problems associated with heat storage in solar ponds eliminated by transparent insulating cover at surface of pond. Cover makes unnecessary salt gradient that suppresses natural convection within pond to promote thermal storage.

B83-10564
PARABOLIC SOLAR COLLECTORS
V. C. TRUSCELLO (CALTECH)
Nov. 1984
NPO-15674 **Vol. 8, No. 2, P. 202**
Paper presents tutorial overview of point focusing parabolic reflectors for solar-energy collectors. Optical and thermal characteristics of collectors discussed in detail.

B83-10565
HIGH-TEMPERATURE HELICAL-TUBE SOLAR RECEIVER
C. ROBERTSON JR. (General Electric Co.) and L. MCCREIGHT (General Electric Co.)

Nov. 1984
NPO-15768 **Vol. 8, No. 2, P. 202**

Solar-thermal receiver used with circular parabolic concentrator to supply about 58 kW thermal power to Brayton engine or industrial process. Solar radiation focused into open end of cylindrical ceramic thermal inertial sleeve 8 in. in diameter that reradiates energy to helical heat exchanger tube surrounding sleeve.

B83-10566
CONCENTRATOR-ENHANCED SOLAR ARRAY
B. J. MORSE (Hughes Aircraft Co.)
Nov. 1984
NPO-15628 **Vol. 8, No. 2, P. 202**

Deployable solar array for satellites uses slanted low-mass planar mirrors as walls of trough to triple light falling on GaAs solar cells forming bottom of trough. Power-to-mass ratio of new design 42 percent higher than planar array of same power output.

B83-10567
EFFICIENCY OF REFLECTION GRATINGS
C. W. CHEN (University of Arizona) and J. C. WYANT (University of Arizona)
Nov. 1984
NPO-15852 **Vol. 8, No. 2, P. 202**

Dichromated gelatin plates evaluated as optical elements for phase-volume holography.

04 MATERIALS

B83-10031
AROMATIC POLYIMIDES WITH GROUP VI LINKAGES
T. L. ST. CLAIR, H. D. BURKS, and R. M. ELY
Aug. 1983 See Also NASA TR-84494(N82-27493/NSP)
LAR-12980 **Vol. 7, No. 3, P. 277**

New polymer system combines thermal and solvent resistant properties of aromatic polyimides with processability of PPX polymers. PPX polymers include polyphenylene oxide, polyphenylene sulfide, and polyphenylene sulfone classes. Generally more processable by hot melt or thermoplastic techniques than aromatic polyimides. PPX systems more susceptible to attack by solvents and have lower glass transition temperatures than PI group.

B83-10032
FUEL-CELL REACTANT-GAS PURIFIER
H. MCBRYAR and T. OLLILA (General Electric Co.)
Aug. 1983
MSC-20103 **Vol. 7, No. 3, P. 278**

Catalytic purifier removes oxygen from hydrogen feedlines just upstream of fuel-cell stack. Purifier consists of layer of platinum sandwiched between two sheets of porous polytetrafluoroethylene (PTFE). Platinum and PTFE elements stacked and ready for pressing. Purifier cut to size, pleated and inserted into convenient length of metal tubing. Purifier is 90 percent efficient in removing oxygen from gas stream containing 2 percent oxygen in hydrogen.

B83-10033
RECYCLING LITHIUM CARBONATE/LITHIUM HYDROXIDE WASTE
J. FLOWERS (Flowers Chemical Laboratories) and J. FLOWERS (Flowers Chemical Laboratories)
Aug. 1983
KSC-11261 **Vol. 7, No. 3, P. 279**

Hazardous waste disposal problem eliminated by regeneration. Li2CO3/ LiOH recycling process relies on low solubility of alkali carbonates in corresponding hydroxides. Li2CO3 precipitate calcined to LI2O, then rehydrated LiOH. Regeneration eliminates need to dispose caustic waste and uses less energy than simple calcination of entire waste mass.

B83-10034
DESULFURIZING COAL BY CHLORINOLYSIS AND HYDROGENATION
J. J. KALVINSKAS (CALTECH) and N. K. ROHATGI (CALTECH)
Aug. 1983
NPO-15304 **Vol. 7, No. 3, P. 280**

85 percent of organic and pyritic sulfur in coal removed by combination of chlorinolysis and hydrogeneration. Coal is fed to hydrogenator after chlorination. Coal flows against hydrogen current increasing mixing and reducing hydrogen consumption. Excess hydrogen is recovered from gaseous reaction products. Product coal contained 62.5 percent less total sulfur than same coal after chlorination.

B83-10035
STRONGER CARBON FIBERS FOR REINFORCED PLASTICS
D. E. CAGLIOSTRO and N. R. LERNER
Aug. 1983
ARC-11261 **Vol. 7, No. 3, P. 280**

Process makes fibers 70 percent stronger at lower carbonization temperature. Stronger carbon fibers result from benzoic acid pretreatment and addition of acetylene to nitrogen carbonizing atmosphere. New process also makes carbon fibers of higher electrical resistance -- an important safety consideration.

B83-10036
GELLED ANTI-ICING AGENTS
O. F. MARKLES (Rockwell International Corp.) and H. H. SPERBER (Rockwell International Corp.)
Aug. 1983
MSC-20088 **Vol. 7, No. 3, P. 281**

Pectin added to antifreeze/water mixture. Formulations include water with dimethyl sulfoxide (DMSO) as deicer and pectin as gel former. Without gelling agent, deicer runs off vertical surfaces. Without pectin solution will completely evaporate in far less time. Agents developed have wide potential for ice prevention on runways, highways, bridges and sidewalks.

B83-10037
PRESERVING COLOR IN DEVELOPED PHOTOGRAPHIC FILM
R. B. HOOVER and C. M. RHODES
Aug. 1983
MFS-23250 **Vol. 7, No. 3, P. 282**

Controlled-atmosphere vault retards fading and deterioration of developed high speed film. Vault with externally controlled valve regulates flow of nitrogen gas from internally mounted tank. Gas purges ambient air from vault through purge valve and maintains vault pressure slightly above ambient.

B83-10038
PROCESS FOR MOLDING NONREINFORCED (NEAT) RESINS
G. E. DICKERSON
Aug. 1983
LAR-12981 **Vol. 7, No. 3, P. 283**

Void free moldings obtained for neat, condensation, thermosetting resins. Thermally and mechanically treat resin prior to molding to reduce amount of volatiles. With volatiles reduced molding temperature and pressure are applied in way to drive out remaining volatiles during molding.

B83-10039
MEASURING DIFFUSION AND RECOMBINATION IN POLYCRYSTALLINE SILICON

J. D. ZOOK (Honeywell, Inc.)
Aug. 1983
NPO-15601 **Vol. 7, No. 3, P. 284**

Light-beam-induced currents yield information about solar cell material. Apparatus measures short-circuit current generated when spot of concentrated light is scanned across grains and grain boundaries in material under test. Technique used to evaluate SOC samples for diffusion and recombination effects of cell processing and chemical and structural defects.

B83-10040
MEASURING DIFFUSION AND RECOMBINATION POLYCRYSTALLINE SILICON
G. E. POLLOCK, F. WOELLER, and D. R. KOJIRO
Aug. 1983
ARC-11431 **Vol. 7, No, 3, P. 284**

Modified solica spheres enhance chromatographic separation. Commercially available silica spheres are modified by reacting them with molecules containing isocyante and isothiocyanate groups. Applications of surface derivatized spheres that result from reaction include analysis of samples prouced by atmospheric or soil probes.

B83-10041
FIRE-RESISTANT COMPOSITES
D. A. KOURTIDES and J. A. PARKER
Aug. 1983
ARC-11331 **Vol. 7, No, 3, P. 285**

Resin blend produces high-char-yield, low-smoke composites. Diglycidyl Ether of Bis-(4-Hydroxyphenyl)-Fluorene is prepared by reacting epichlorohydrin and sodium hydroxide with 9,9-bis(hydroxyphenyl) fluorene. End of reaction determined by gas or liquid chromatography, mass spectroscopy or infrared techniques. Used to manufacture printed circuit boards and panels for buildings, ships and aircraft.

B83-10042
STANDARDS FOR EPOXIES USED IN MICROELECTRONICS
S. V. CARUSO (Rockwell International Corp.), J. LICARI (Rockwell International Corp.), B. L. WEIGAND (Rockwell International Corp.), and C. SOYKIN (Rockwell International Corp.)
Aug. 1983
MFS-25810 **Vol. 7, No, 3, P. 286**

Improved qualification standards and test procedures for epoxy adhesives used in assembly of high-reliability hybrid microcircuits listed in new report. Objective of standards to resolve problems in areas of outgassing, bond shear strength, corrosivity, volume resistivity, ionic impurities, electrical stability, and frequency of qualification testing.

B83-10043
MODIFIED ANTIFREEZE LIQUIDS FOR USE ON SURFACES
R. O. LYNN
Aug. 1983
MFS-25741 **Vol. 7, No, 3, P. 286**

Report presents results of evaluation of two antifreeze liquids, dimethyl sulfoxide and ethylene glycol and five viscosity modifiers: gelatin, gum tragacanth, starch, agarose powder and citrus pectin. Purpose of evaluation to find best way of dealing with frost formation on Space Shuttle.

B83-10044
SOLIDIFYING BI/MNBI AT LOW GRAVITY
J. DRAUCH (Grumman Aerospace Corp.), R. LANGE (Grumman Aerospace Corp.), R. A. PIRICH (Grumman Aerospace Corp.), and W. POIT JR. (Grumman Aerospace Corp.)
Aug. 1983
MFS-25736 **Vol. 7, No, 3, P. 286**

Directional solidification of Bi/MnBi magnetic alloy under low gravity enhances magnetic properties. Magnetic properties of low-gravity Bi/MnBi alloy make attractive material for use in motors and other small electrical and electronic components.

B83-10151
SOLVENT-RESISTANT POLYSULFONES
P. M. HERGENROTHER
Oct. 1983
LAR-12931 **Vol. 7, No. 4, P. 401**

Polysulfones terminated with trimethylsilylethynyl, ethynyl, and phenylethynyl groups increased solvent resistance. Upon application of heat, with or without catalyst, end groups react to provide cross linking and chain extension. Result: temperature of polymer increased, more importantly, solvent resistance greatly improved. Solutions used conveniently for preparation of films, coatings, membranes, prepreg, and adhesive tapes.

B83-10152
MEASURING EPOXY-CURING KINETICS
M. CIZMECIOGLU (Caltech)
Oct. 1983
NPO-15710 **Vol. 7, No. 4, P. 402**

Key reaction parameters estimated from single run. Single DSC Curve used to construct linearized plot from which kinetic reaction parameters are obtained: vertical axis intercept proportional to activation energy, while slope equals reaction order. DSC methods show promise for rapid screening and estimation of cure kinetic parameters of epoxy resins.

B83-10153
SUPERCRITICAL-MULTIPLE-SOLVENT EXTRACTION FROM COAL
W. CORCORAN (Caltech), W. FONG (Caltech), P. PICHAICHANARONG (Caltech), P. CHAN (Caltech), and D. LAWSON (Caltech)
Oct. 1983
NPO-15767 **Vol. 7, No. 4, P. 403**

Large and small molecules dissolve different constituents. Experimental apparatus used to test supercritical extraction of hydrogen rich compounds from coal in various organic solvents. In decreasing order of importance, relevant process parameters were found to be temperature, solvent type, pressure, and residence time.

B83-10154
CALCIUM FREE ASBESTOS FOR FUEL CELLS
B. A. SNITZER (United Technologies Corp.)
Oct. 1983
MSC-20207 **Vol. 7, No. 4, P. 404**

Organic-acid salt removes unwanted calcium without weakening asbestos. Asbestos mixed with disodium ethylene diamine tetraacetic acid (disodium EDTA) in water and agitated for 2 hours. After disodium EDTA solution is drained away, asbestos contains only 0.02 to 0.1 percent calcium. Fiber structure of asbestos unaffected.

B83-10155
GENERATING SIF4 FROM H2SIF6
K. C. HANSEN (Lamar University) and C. L. YAWS (Lamar University)
Oct. 1983
NPO-15721 **Vol. 7, No. 4, P. 404**

Sodium and barium fluorosilicates precipitated and thermally decomposed into silicon tetrafluoride. Barium fluorosilicate thermally decomposes at lower temperatures in shorter times, to give same percentage yield of silicon tetrafluoride gas, than sodium fluorosilicate. Salt byproducts of decompositions recycled to precipitate fluorosilicates from hexafluorosilicic acid, the primary reactant.

B83-10156
IMPROVED 02/H2 GAS MIXTURE SENSOR
L. C. MOULTHROP (General Electric Co.)
Oct. 1983
MSC-20408 **Vol. 7, No. 4, P. 406**

Monitor of mixture concentrations uses catalyzed and uncatalyzed temperature probe. Sensor includes Pt-catalyzed temperature probe mounted in line with similar uncatalyzed temperature probe. Use of common temperature probes and standard, flareless, high-pressure tubefittings resulted in design conductive to installation in almost any system. Suitable for use in regenerative fuel cells, life-support systems, and other closed systems.

B83-10157
DIRECTIONAL SOLIDIFICATION OF MONOTECTIC ALLOYS
A. HELLAWELL (Michigan Technological University)
Oct. 1983
MFS-25767 **Vol. 7, No. 4, P. 408**
Cooling at certain rates produced fibrous composite structures. Alloy samples melted in alumina or graphite crucibles under argon and then chillcast into 33-mm-diameter rods or sucked directly into 3-mm-bore alumina or silica tubes. Alloying not automatic with immiscible components of different densities and widely different melting points.

B83-10158
PREDICTING SINGERED-METAL RESISTIVITY FROM POROSITY
R. F. FEDORS (CALTECH)
Oct. 1983
NPO-15587 **Vol. 7, No. 4, P. 407**
Formula with one adjustable parameter relates electrical resistivity of sintered metal plate to porosity of plate. Sintered plate formed by heating compressed metal powder- without meltinguntil particles adhere. Sintered nickel plates of high porosity used as substrates for electrodes in nickel/cadmium batteries.

B83-10159
DIRECTIONAL SOLIDIFICATION OF MONOTECTIC ALLOYS
A. HELLAWELL (Michigan Technological University)
Oct. 1983
MFS-25767 **Vol. 7, No. 4, P. 408**
Cooling at certain rates produced fibrous composite structures. Alloy samples melted in alumina or graphite crucibles under argon and then chillcast into 33-mm-diameter rods or sucked directly into 3-mm-bore alumina or silica tubes. Alloying not automatic with immiscible components of different densities and widely different melting points.

B83-10160
STRESS CORROSION CRACKING OF CERTAIN ALUMINUM ALLOYS
K. R. HASSE (Kaiser Aluminum & Chemical Corporation) and R. C. DORWARD (Kaiser Aluminum & Chemical Corporation)
Oct. 1983
MFS-25773 **Vol. 7, No. 4, P. 409**
SC resistance of new high-strength alloys tested. Research report describes progress in continuing investigation of stress corrosion (SC) cracking of some aluminum alloys. Objective of program is comparing SC behavior of newer high-strength alloys with established SC-resistant alloy.

B83-10161
CRACKS IN GLASS POLYMERS INDUCED BY SOLVENT ABSORPTION
R. F. FEDORS (CALTECH)
Oct. 1983
NPO-15072 **Vol. 7, No. 4, P. 409**
Combination of soluble particles and absorbed solvents cause polymer cracking. New failure mechanism in glassy polymers identified. Cracking caused by presence of particles insoluble in polymer matrix but soluble in solvent. Experiments performed and equations describe cracking phenomenon set forth in concise report.

B83-10162
FREEZE/THAW PROPERTIES OF CELLULAR GLASS
P. O. FRICKLAND (CALTECH), E. L. CLELAND (CALTECH), and T. HASEGAWA (CALTECH)
Oct. 1983
NPO-15854 **Vol. 7, No. 4, P. 409**
Without moisture, temperature cycles do no harm. Experiments described in new report indicate inherent material variability greater deterrent to application of material than freeze/thaw effects.

B83-10163
RANDOM LIFE CURVES FOR COMMON ENGINEERING MATERIALS
T. HU (Rockwell International Corp.)
Oct. 1983
MSC-20433 **Vol. 7, No. 4, P. 410**
Program incorporates non-Rayleigh effects in evaluating structure life. RMS2 computer program converts constant amplitude fatigue allowables to random-loading allowables, with influence of peak distribution and mean stress considered. RMS2 written in FORTRAN IV.

B83-10326
ONE-STEP COAL LIQUEFACTION
S. A. QADER (CALTECH)
Apr. 1984
NPO-15891 **Vol. 8, No. 1, P. 51**
Steam injection improves yield and quality of product. Single step process for liquefying coal increases liquid yield and reduces hydrogen consumption. Principal difference between this and earlier processes includes injection of steam into reactor. Steam lowers viscosity of liquid product, so further upgrading unnecessary.

B83-10327
MOLTEN SLAG WOULD BOOST COAL CONVERSION
J. F. FERRALL (CALTECH)
Apr. 1984
NPO-15711 **Vol. 8, No. 1, P. 52**
Reactor increases residence time of uncovered char. Near-100-percent carbon conversion achievable in reactor incorporating moltenslag bath. Slag maintains unconverted carbon impinging on surface at high temperatures for longer period of time, enhancing conversion.

B83-10328
SILICONE CERENKOV-RADIATOR MATERIAL
V. BALASUBRAHMANYAN, J. F. ORMES, and R. E. STREITMATTER
Apr. 1984
GSC-12805 **Vol. 8, No. 1, P. 52**
Dyes enhance visible output. Three fluorescent dyes combine to increase output of silicone material that normally has low yield of visible Cerenkov radiation by converting large amount of available ultraviolet photons into visible light.

B83-10329
DETECTING METHANE LEAKS
W. B. GRANT (CALTECH) and E. D. HINKLEY (CALTECH)
Apr. 1984
NPO-15790 **Vol. 8, No. 1, P. 53**
Remote sensor uses laser radiation backscattered from natural targets. He/Ne Laser System for remote scanning of Methane leaks employs topographic target to scatter light to receiver near laser transmitter. Apparatus powered by 1.5kW generator transported to field sites and pointed at suspected methane leaks. Used for remote detection of natural-gas leaks and locating methane emissions in landfill sites.

B83-10330
POLYCARBOSILAZANE-RESIN POLYMERIZATION PROCESS
B. PENN, E. LEDBETTER III, and J. CLEMONS
Apr. 1984
MFS-25758 **Vol. 8, No. 1, P. 54**
Process suitable for production of silicon nitride/silicon carbide fibers. High-tensile-strength silicon carbide/silicon nitride fibers prepared by pyrolyzing fibers drawn from melt of polycarbosilazane resin. Such fibers show promise as replacements for carbon fibers in high-strength composites for automotive, aerospace, and other applications where high electrical conductivity of carbon fibers makes them unsuitable.

B83-10331
SIXNYCZ FIBERS FOR SAFER COMPOSITES
F. LEDBETTER III, B. PENN, and J. CLEMONS
Apr. 1984
MFS-25721 **Vol. 8, No. 1, P. 55**
Silicon nitride/silicon carbide fibers prepared by pyrolysis of polycarbosilazanes proposed substitute for carbon fibers. Silicon nitride/silicon carbide fibers tested pyrolyzed from polycarbosilazanes prepared from tris(N-methylamino) methylsilane. Polycarbosilazane resin drawn into fiber from melt, treated and pyrolyzed. Pyrolyzed fibers are shiny black. Tests show new fibers have physical properties comparable to graphite but with lower conductivity.

B83-10332
SILICON NITRIDE ANTIREFLECTION COATINGS FOR PHOTOVOLTAIC CELLS
C. JOHNSON, T. WYDEVEN, and K. DONOHOE (Tegal Corp.)
Apr. 1984
ARC-11447 **Vol. 8, No. 1, P. 55**
Chemical-vapor deposition adapted to yield graded index of refraction. Silicon nitride deposited in layers, refractive index of which decreases with distance away from cell/coating interface. Changing index of refraction allows adjustment of spectral transmittance for wavelengths which cell is most effective at converting light to electric current. Average conversion efficiency of solar cells increased from 8.84 percent to 12.63 percent.

B83-10333
IMPROVING TRACE-ION SENSITIVITY
R. N. BUGGLE (Honeywell, Inc.)
Apr. 1984
MFS-25766 **Vol. 8, No. 1, P. 56**
Background noise reduced by some special precautions. Blanket of argon flows over solution so no chance for contamination from air to creep in. Conventional pump replaced with one made of polytetrafluoroethlylene component and all metal couplings eliminated from flow lines. Used to improve quality control in integrated circuit fabrication, lens fabrication, and vacuum-tube assembly.

B83-10334
DISCHARGE EXTRACTS OXYGEN FROM CO2
R. S. LUCE (Lockheed Missiles & Space Co.)
Apr. 1984
ARC-11305 **Vol. 8, No. 1, P. 57**
Process under development supplies oxygen for life support in hazardous environments. Prototype CO2 reactor vessel produces oxygen from carbon dioxide at expense of about 100 watt-hours of electricity per liter of gas reduced. Design changes to improve efficiency include narrowing gap between walls to operate at lower voltages and increasing area of one electrode while decreasing area of other to reduce capacitance.

B83-10335
PERFLUOROALKYLENE-ETHER TRIAZINE ELASTOMERS
R. W. ROSSER, T. S. CHEN (San Jose State University), and C. CHENG (San Jose State University)
Apr. 1984
ARC-11402 **Vol. 8, No. 1, P. 58**
New process yields product that resists heat and action of oxygen and water. Ring closing step, which gives elastomer its stability, imidoylamidine dinitrile reacts with perfluoroether acide, yielding prepolymer. Prepolymer then treated with ammonia and cured by heating to form polymer. Elastomers are highly resistant to heat, oxidation, and hydrolysis.

B83-10336
ELASTOMER-MODIFIED POLYIMIDES
G. M. FOHLEN, J. PARKER, and I. K. VARMA
Apr. 1984
ARC-11400 **Vol. 8, No. 1, P. 58**
New resins yield laminates with improved mechanical properties. Ingredients of Modified Polymer include bisimide of formula 1 and amine-terminated elastomer. Cure effected by heating to temperature suited to particular ingredients used, generally in range of 200 degrees to 300 degrees C. Solution of solvent and reactants used for fabricating fiber-reinforced structures or as adhesive.

B83-10337
PREDICTING MOISTURE ABSORPTION IN COMPOSITE MATERIALS
J. R. HAINES (McDonnell Douglas Corp.)
Apr. 1984
MSC-20109 **Vol. 8, No. 1, P. 60**
Heat transport programs adaptable for absorption analysis. Lightweight sandwich panel specimen used for comparison of water absorption measurements with program predictions. In program model, moisture -- like heat in heat-transport problem moves through variety of materials and structures along complex paths.

B83-10338
IMPROVED POLYIMIDE INTUMESCENT COATING
I. O. SALYER (University of Dayton) and L. B. FOX (University of Dayton)
Apr. 1984
ARC-11369 **Vol. 8, No. 1, P. 60**
New polyimide intumescent coating uses titanium dioxide and glass microballons as nucleating agents to improve foaming characteristics of commercially-available polyimide precursor resin. Used for coating interior surfaces in commercial aircraft.

B83-10339
EVALUATION OF STRUCTURAL CELLULAR GLASS
M. A. ADAMS (CALTECH) and J. G. ZWISSLER (CALTECH)
Apr. 1984
NPO-15680 **Vol. 8, No. 1, P. 61**
Preliminary design information presented. First report discusses state of structural-cellular-glass programs as of June 1979. Second report gives further details of program to develop improved cellular glasses and to characterize properties of glasses and commercially available materials.

B83-10340
MICROFISSURING IN NICKEL-BASED-ALLOY WELDS
R. G. THOMPSON (Clemson University)
Apr. 1984
MFS-25815 **Vol. 8, No. 1, P. 61**
Cracking mechanisms proposed. Investigation of physical metallurgy of near-solidus integranular cracking or microfissuring in Inconel 718 alloy welds described in report. Investigation sought to identify cause of microfissuring and quantify its behavior.

B83-10341
IMPROVED THERMOSETTING IMIDE RESINS
G. M. FOHLEN, J. A. PARKER, and I. K. VARMA (NRC)
Apr. 1984
ARC-11368 **Vol. 8, No. 1, P. 62**

Modified resins have lower curing temperature. Imide monomers are chemically modified to lower cure temperature by 90 degrees, without compromising flame resistance of cured resins made from them.

B83-10342
STRESS-CORROSION CRACKING IN MARTENSITIC PH STAINLESS STEELS
T. HUMPHRIES and E. NELSON
Apr. 1984
MFS-25400 **Vol. 8, No. 1, P. 62**
Precipitation-hardening alloys evaluated in marine environment tests. Report describes marine-environment stress-corrosion cracking (SCC) tests of three martensitic precipitation hardening (PH) stainless-steel alloys.

B83-10343
NITROGEN SUPPLY USES HYDRAZINE
D. B. HEPPNER (Life Systems, Inc.)
Apr. 1984
ARC-11464 **Vol. 8, No. 1, P. 62**
Liquid hydrazine dissociated and residual gas removed to produce almost pure nitrogen. Nitrogen-generation module catalytically dissociates liquid hydrazine then dissociates and separates product gases to yield almost pure nitrogen.

B83-10344
WALNUT HULLS CLEAN ALUMINUM
W. R. COLBERG, G. H. GORDON, and C. H. JACKSON
Apr. 1984
MFS-27012 **Vol. 8, No. 1, P. 63**
Hulls inflict minimal substrate damage. Walnut hulls found to be best abrasive for cleaning aluminum surfaces prior to painting. Samples blasted with walnut hulls showed no compressive stress of surface.

B83-10345
LOW-PRESSURE ALCOHOL DISTILLATION
D. O. FRAZIER, F. W. ZUR BURG, and J. C. CODY
Apr. 1984
MFS-25516 **Vol. 8, No. 1, P. 63**
Heat requirements lowered for process. Temperature requirements lowered enough to make solar heat absorbed by flat-plate collectors feasible energy source. Alcohol produced without adding other solvents, eliminating need for dehydration or hydrocarbon stripping as final step.

B83-10346
DIESEL PARTICULATE DESTRUCTION
L. C. YANG (CALTECH)
Apr. 1984
NPO-15426 **Vol. 8, No. 1, P. 63**
Pulsed electrical discharge eliminates particulates in diesel exhaust. Particulates in diesel exhaust gas destroyed by passing them through agglomerator and series of high voltage-biased grids.

B83-10347
DISSOLVING BUBBLES IN GLASS
M. C. WEINBERG (CALTECH), P. I. ORONATO (GTE Corp.), and D. R. UHLMANN (MIT)
Apr. 1984
NPO-15105 **Vol. 8, No. 1, P. 63**
Analytical expression used to calculate time it takes for stationary bubbles of oxygen and carbon dioxide to dissolve from glass melt. Technique based on analytical expression for bubble radius as function time, with consequences of surface tension included.

B83-10348
PACKAGING NUCLEAR AND CHEMICAL WASTE FOR DISPOSAL
T. G. WANG (CALTECH)
Apr. 1984
NPO-15454 **Vol. 8, No. 1, P. 63**
In proposed method, nuclear and chemical waste quickly encapsulated in hollow silicon spheres by forming, filing and sealing sphere. Process entirely automated.

B83-10349
EXTRACTING OIL FROM TAR SANDS
L. B. FORD (CALTECH) and D. DALY (CALTECH)
Apr. 1984
NPO-15760 **Vol. 8, No. 1, P. 63**
Recovery of oil from tar sands possible by batch process, using steam produced by solar heater. In extraction process, solar heater provides steam for heating solvent boiler. Boiling solvent removes oil from tar sands in Soxhlet extractor.

B83-10350
MONITORING LIGNIN CONTENT IN PAPER PROCESSING
H. G. BOETTGER (CALTECH)
Apr. 1984
NPO-15796 **Vol. 8, No. 1, P. 64**
Feedstock and finished pulp analyzed and controlled automatically. System acquires samples from feed hopper, digestor, and blow tank. Sample homogenized, washed, and dried while conveyed to flash pyrolyzer. In pyrolyzer material converted into basic constituent, mostly compounds of molecular weight less than 200.

B83-10351
CERAMICS FOR SOLAR RECEIVERS
A. A. KUDIRKA (CALTECH)
Apr. 1984
NPO-15763 **Vol. 8, No. 1, P. 64**
Materials for high-temperature use reviewed. Report discusses characteristics of ceramics and assesses potential of candidate materials in solar receivers. Design requirements presented, including those for receiver with fluid exit temperatures up to 1,425 degrees C.

B83-10352
SIALON ELECTRODES AND INSULATORS FOR MHD DEVICE
W. M. PHILLIPS (CALTECH)
Apr. 1984
NPO-14945 **Vol. 8, No. 1, P. 64**
Rectangular magnetohydrodynamic (MHD) channel structure for electrical power generation designed using pure sialon ceramic for insulating portion of structure and metal-bearing sialon cermet for conducting portion.

B83-10353
REMOVING IMAGES FROM MICROFILM
L. L. TAYLOR (CALTECH)
Apr. 1984
NPO-15146 **Vol. 8, No. 1, P. 64**
Film softened, scraped, and then dried. Unwanted images removed from microfilm for softening base film with hot water, scraping film and drying with isopropyl alcohol. Method simple and no visible damage to film.

B83-10354
GLASS FOR SOLAR CONCENTRATORS
F. L. BOUQUET (CALTECH)
Apr. 1984
NPO-14923 **Vol. 8, No. 1, P. 64**
Report identifies four commercially available glasses as promising reflectors for solar concentrators. Have properties of high reflectance (80 to 96 percent), lower cost than first-surface silver metalization, and resistance to environmental forces.

B83-10355
REDUCING SOOT IN DIESEL EXHAUST
J. BELLAN (CALTECH)
Apr. 1984
NPO-15715 **Vol. 8, No. 1, P. 64**

Electrically charged fuel improves oxidation. Fuel injection system reduces amount of soot formed in diesel engines. Spray injector electrically charges fuel droplets as they enter cylinder. Charged droplets repel each other, creating, dilute fuel mist easily penetrated by oxygen in cylinder.

B83-10356
THREE-ZONE CATALYST RESISTS SULFUR POISONING
G. E. VOECKS (CALTECH), M. F. STEPHANOPOULOS (CALTECH), and J. HOUSEMAN (CALTECH)
Apr. 1984
NPO-14827 **Vol. 8, No. 1, P. 65**
Three-zone catalyst bed uses different types of nickel catalysts to convert sulfur-containing hydrocarbon fuels to hydrogen and carbon monoxide. Zones designed to achieve conversion with minimal residue of unconverted hydrocarbon, no soot and mimimal sulfur contamination.

B83-10357
COMBINED SILANE PYROLYSIS AND SILICON-PARTICLE MELT
H. LEVIN (CALTECH)
Apr. 1984
NPO-15510 **Vol. 8, No. 1, P. 65**
Melter directly coupled to pyrolyzer eliminates difficulties of transport. Proposed coupling of free-space silane pyrolyzer and melter without intervening steps produce molten silicon with no problems of fine-particle movement, storage, contamination in transport, or oxide formation.

B83-10358
EPOXY GROUT WITH SILICA THICKENER
C. E. MCCLUNG (Monsanto Research Corp.)
Apr. 1984
NPO-15202 **Vol. 8, No. 1, P. 65**
Grout cures quickly, even in presence of hydraulic oil. Grout is mixture of aggregate particles, finely-divided silica, epoxy resin, and triethylenetetramine curing agent, with mixture containing about 85 percent silica and aggregate particle sand 15 percent resin and curing agent. Silica is thickening agent and keeps grout from sagging.

B83-10359
MEASURING TRACE HYDROCARBONS IN SILANES
L. A. LESSER (Union Carbide Corp.)
Apr. 1984
NPO-15273 **Vol. 8, No. 1, P. 65**
Technique rapid and uses standard analytical equipment. Silane gas containing traces of hydrocarbons injected into carrier gas of moist nitrogen having about 0.2 percent water vapor. Carrier, water and silane pass through short column packed with powdered sodium hydroxide which combines moisture and silane to form nonvolatile sodium silicate. Carrier gas free of silane but containing nonreactive hydrocarbons, pass to silica-gel column where chromatographic separation takes place. Hydrocarbons measured by FID.

B83-10360
PLATED METAL POWDERS FOR ELECTRODE PASTES
D. B. BICKLER (CALTECH)
Apr. 1984
NPO-15161 **Vol. 8, No. 1, P. 65**
Metal grains to be sintered precoated with frit metal. Coated metal powders used to make ink-like electrode pastes for printing and sintering electrode-fabrication process. Grains of base metal coated with lowmelting-point--, lead or tin-- by electroless deposition.

B83-10361
RHENIUM PREVENTS CORROSION
M. A. APPEL (CALTECH)
Apr. 1984
NPO-15011 **Vol. 8, No. 1, P. 66**
Rhenium layer inside carbon-composite thrust chamber prevents corrosion when liquid fluorine/hydrazine rocket engine is fired. Liner also eliminates erosion of solid propellant carbon nozzels.

B83-10362
HYDROGEN PRODUCTION FROM HEAVY FUELS
G. E. VOECKS (CALTECH) and M. F. STEPHANOPOULOS (CALTECH)
Apr. 1984
NPO-14826 **Vol. 8, No. 1, P. 66**
Better heat transfer properties avoid sulfur poisoning of catalyst. Monolithic supported catalyst allows initiation of steam reforming to take place more rapidly at inlet section of reactor.

B83-10363
MAKING THERMOPLASTICS FLAME-RESISTANT
W. A. MUELLER (CALTECH), J. D. INGHAM (CALTECH), and W. W. REILLY (CALTECH)
Apr. 1984
NPO-14857 **Vol. 8, No. 1, P. 66**
Inorganic hydrate-salt filler coated with elastomer containing acidic groups imparts flame and smoke retardancy to thermoplastics while preventing degradation of impact resistance that results from high filler loadings in thermoplastic.

B83-10364
RADIATION IMPROVES MATERIALS BONDING
F. L. BOUQUET (CALTECH)
Apr. 1984
NPO-14995 **Vol. 8, No. 1, P. 66**
Bonds with fluorocarbons made with surface preparation. Irradiating rubber-based adhesives produce strong adhesive bond with fluorocarbons without extensive surface preparation.

B83-10365
DEWATERING PEAT WITH ACTIVATED CARBON
N. K. ROHATGI (CALTECH)
Apr. 1984
NPO-15113 **Vol. 8, No. 1, P. 66**
Proposed process produces enough gas and carbon to sustain itself. In proposed process peat slurry is dewatered to approximately 40 percent moisture content by mixing slurry with activated carbon and filtering with solid/liquid separation techniques.

B83-10366
IMPROVED GAS SEAL FOR ELECTROLYTIC CELLS
R. RICHTER (CALTECH)
Apr. 1984
NPO-15163 **Vol. 8, No. 1, P. 66**
Breakage by differential thermal expansion reduced. Cells for hot electrolysis of gases improved by design that reduces vulnerability of gas seals to breakage at operating temperature of about 1000 degrees C.

B83-10568
RECOVERING ZINC FROM DISCARDED TIRES
E. R. DU FRESNE (CALTECH)
Nov. 1984
NPO-16046 **Vol. 8, No. 2, P. 205**
Zinc sulfate monohydrate sold at profit. Shredded tire material steeped in three sulfuric acid baths to extract zinc. Final product removed by evaporating part of solution until product crystallizes out. Recovered as zinc sulfate monohydrate and sold as fertilizer or for general use.

B83-10569
PACKED ALUMINA ABSORBS HYPERGOLIC VAPORS
J. J. THOMAS (Florida Institute of Technology) and D. M. MAURO (Florida Institute of Technology)
Nov. 1984
KSC-11278 **Vol. 8, No. 2, P. 206**
Beds of activated alumina effective as filters to remove

hypergolic vapors from gas streams. Beds absorb such substances as nitrogen oxides and hydrazines and may also absorb acetylene, ethylene, hydrogen sulfide, benzene, butadiene, butene, styrene, toluene, and xoylene. Bed has no moving parts such as pumps, blowers and mixers. Reliable and energy-conservative. Bed readily adapted to any size from small portable units for use where little vapor release is expected to large stationary units for extensive transfer operations.

B83-10570
CONTAINERLESS SOLIDIFICATION OF AMORPHOUS METALS
M. C. LEE (CALTECH) and W. L. JOHNSON (CALTECH)
Nov. 1984
NPO-15776 **Vol. 8, No. 2, P. 207**

Method produces large amorphous alloys. Spheres of amorphous metal alloys formed and collected after molten samples coated and cooled in drop tube. Coated spheres cooled acoustically and cryogenically. Amorphous specimens 5mm in diameter or larger possible.

B83-10571
CHARRING, NONMELTING EPOXY FOAMS
C. B. DELANO (Acurex Corp.)
Nov. 1984
MFS-25911 **Vol. 8, No. 2, P. 208**

Addition of vanadium compounds prevents melting. For safety, structural plastic foam should turn into rigid char when it burns, without melting. Addition of small amounts of vanadium compounds to some epoxy resins promotes char formation.

B83-10572
OXIDATION-RESISTANT SLURRY COATING FOR CARBON-BASED MATERIALS
J. L. SMIALEK
Nov. 1984
LEW-13951 **Vol. 8, No. 2, P. 208**

New process uses paint sprayer and vacuum furnace to produce silicon carbide outer layer. In cross section of silicon and silicon carbide reaction zone, top layer of silicon adheres to silicon carbide layer. Crystals prominent on melted top surface of slurry coating. Process especially useful in coating repair.

B83-10573
TWO-LAYER GLASS THERMAL-CONTROL COATING
D. A. STEWART, H. E. GOLDSTEIN, and D. B. LEISER (Stanford University)
Nov. 1984
ARC-11164 **Vol. 8, No. 2, P. 209**

Optical properties endure high temperatures. Coating has outer scattering layer and inner high emissivity layer. Absorptivity/emissivity ratio less than 0.4. Coating withstands repeated exposure to temperatures in excess of 2,000 degrees F. Coating has industrial uses in solar-energy equipment, high temperature chemical processing systems, laboratory equipment and high temperature instrumentation.

B83-10574
CONTINOUS MONITORING OF MELT COMPOSITION
R. E. FRAZER (CALTECH) and T. W. ANDREWS (CALTECH)
Nov. 1984
NPO-15896 **Vol. 8, No. 2, P. 210**

Compositions of glasses and alloys analyzed and corrected in real time. Spectral analysis and temperature measurement performed simultaneously on molten material in container, such as open-hearth furnace, crucible or tank of continuous furnace. Speed of analysis makes it possible to quickly measure concentration of volatile elements depleted by prolonged heating.

B83-10575
LOW-DENSITY HIGH-STRENGTH FOAMED MATERIALS
T. WANG (CALTECH), D. ELLEMAN (CALTECH), and J. M. KENDALL JR. (CALTECH)
Nov. 1984
NPO-15411 **Vol. 8, No. 2, P. 211**

Molten bubbles of metal or plastic coalesce into strong, lightweight materials that look like solidified foam. Bubbles formed in compartment that receives molten material and compressed gas that fills bubbles. Compartment has matrix of nozzles. Leaving nozzles, bubbles fall into acoustic chamber and coalesce; then drop through funnel and are cast into desired shape by extrusion or molding. Materials used for construction, extruded into molds, sawed, nailed, and generally handled as wood.

B83-10576
ESTIMATING THE LIFETIMES OF NICKEL/CADMIUM CELLS
R. F. FEDORS (CALTECH), S. D. HONG (CALTECH), A. GUPTA (CALTECH), and M. CIZMECIOGLU (CALTECH)
Nov. 1984
NPO-15145 **Vol. 8, No. 2., P. 212**

Equation based on model of flaw growth. Model assumes cell fails by growth of preexisting flaws. Flaws described by three important quantities: total number of flaws, distribution of flaw sizes and rate of flaw growth. When flaw reaches critical size failure occurs. Flaw concept, in addition to providing ready explanation for reduced lifetime, predicts two important charateristics: statistical variability of lifetime data and dependence of lifetime on volume of sample.

B83-10577
FIRE-RESISTANT TFE EXTRUSIONS
A. T. SHEPPARD (Martin Marietta Corp.)
Nov. 1984
MFS-25917 **Vol. 8, No. 2, P. 212**

Fire resistance of extruded tetrafluoroethylene (TFE) polymers improved by substitution of chlorinated hydrocarbon as wetting agent. Replacement of naphtha with perchloroethylene yields polymer that extrudes well and generates fewer pinholes. Product less susceptible to fire during manufacturing and in service.

B83-10578
IN SITU CROSS-LINKING OF POLYVINYL ALCOHOL FILMS
W. H. PHILIPP, L. C. SHU, and C. E. MAY
Nov. 1984 See Also NASA-TP-1407 (N79-21128/NSP)
LEW-13135 **Vol. 8, No. 2, P. 213**

Films or impregnated matrices readily made from aqueous polyvinyl alcohol solution. Controlled thickness films made by casting precise quantities of aqueous polymer solution on smooth surface, allowing water to evaporate and then removing film. Composite separators formed in similar fashion by impregnating cloth matrix with polyvinyl alcohol solution and drying composite. Insoluble thin hydrophilic membranes made from aqueous systems, and use of undesirable organic solvents not required.

B83-10579
BINDER FOR CARBON-FIBER COATING
W. L. DOWLER (CALTECH), K. N. RAMOHALLI (CALTECH), S. P. S. YEN (CALTECH), W. A. MUELLER (CALTECH), and J. HARPER (CALTECH)
Nov. 1984
NPO-14988 **Vol. 8, No. 2, P. 214**

Insoluble, even coating formed by soaking in polyacrylic acid. Carbon fiber material prepared by soaking in solution of 20 percent polyacrylic acid in water. Material blotted and dried at 120 degrees C for at least 2 hours. Dried material reacted with boiling aqueous solution of calcium acetate. Treated material removed from boiling solution, blotted, dried at 120 degrees C, washed with distilled water, and dried again.

B83-10580
DYE INDICATORS FOR ACIDIC OR BASIC SURFACE CONTAMINATION
A. LAKIN (Rockwell International Corp.) and F. SCHULER (Rockwell International Corp.)
Nov. 1984
MFS-19387 **Vol. 8, No. 2, P. 214**
Application of pH-sensitive dye solution serves as test for acidic or basic contamination of critical bonding surface. Aqueous solution of 0.1 percent Direct Red No. 28 capable of indicating acid activating solution down to 10 parts per million on hardware and tooling. Dye did not cause detectable contamination of surface.

B83-10581
CONTAINERLESS PROCESSING OF ADVANCED GLASSES
R. HAPPE (Rockwell International Corp.) and K. KIM (Rockwell International Corp.)
Nov. 1984
MFS-27002 **Vol. 8, No. 2, P. 214**
Report describes investigation of containerless processing of glass, conducted in preparation of gravity-free processing experiments on board Space Shuttle. 105 candidate glass materials screened. Large number of oxide proportions studied and ternary phase diagram of glass formation developed as result.

B83-10582
DESTROYING TOXIC WASTES
G. E. VOECKS (CALTECH)
Nov. 1984
NPO-15655 **Vol. 8, No. 2, P. 215**
Toxic pesticides and halogenated hydrocarbons converted to fuels and harmless waste by catalyzed combustion. These product gases used directly as fuel or catalytically converted to methanol.

B83-10583
HOLLOW SPHERES OF METALLIC GLASS
M. C. LEE (CALTECH)
Nov. 1984
NPO-15991 **Vol. 8, No. 2, P. 215**
Uniform hollow spheres of gold/lead/antimony glass formed by blowing bubbles of molten metal into helium-filled drop tube. Useful in fusion target applications.

B83-10584
PLASMA-SPRAYED COPPER TIE-IN FOR NICKEL PLATING
J. W. LOMBARD (Rockwell International Corp.) and J. E. OTOUSA (Rockwell International Corp.)
Nov. 1984
MFS-19481 **Vol. 8, No. 2, P. 215**
Foam insulation nickel-plated with one less step. Changing tie-in layer from plasma-sprayed nickel to plasma-sprayed copper eliminates intermediate copper electroplating step previously required.

B83-10585
MAKING SIXNYCZ FIBERS BY PYROLYSIS
R. MARKLE (Battelle Columbus Laboratories), I. SEKERCIOGLU (Battelle Columbus Laboratories), D. HILL (Battelle Columbus Laboratories), R. R. WILLIS (Battelle Columbus Laboratories), and R. SINCLAIR (Battelle Columbus Laboratories)
Nov. 1984
MFS-25621 **Vol. 8, No. 2, P. 215**
Investigation part of continuing effort to produce fibers strong enough to replace graphite in fiber/polymer composites.

B83-10586
ETCHANTS FOR SOME CORROSION-RESISTANT METALS
J. SIMMONS (Martin Marietta Aerospace)
Nov. 1984 See Also NASA CR-161431 (N80-25414/NSP)
MFS-25467 **Vol. 8, No. 2, P. 216**
Solutions that etch some corrosion-resistant metals described in test report. Etchants selected remove at least 0.4 mil of surface material per hour from nickel alloys, austenitic stainless steel, and annealed titanium alloys, without intergranular attack.

B83-10587
HOT MICROFISSURING IN NICKEL ALLOY
R. G. THOMPSON (University of Alabama) and A. NUNES
Nov. 1984 See Also NASA CR-161878 (N82-10194/NSP)
MFS-25763 **Vol. 8, No. 2, P. 216**
Experiments in intergranular cracking of nickel alloy near solidus temperature discussed in contractor report. Purpose of investigation development of schedule for welding, casting, forging, or other processing of alloy without causing microfissuring.

B83-10588
ADDITIONAL HEAT TREATMENT FOR SILICA-FIBER INSULATION
E. MADUK (Lockheed Missiles & Space Co., Inc.), I. CARPENTER (Lockheed Missiles & Space Co., Inc.), and E. GZOWSKI (Lockheed Missiles & Space Co., Inc.)
Nov. 1984
MSC-20600 **Vol. 8, No. 2, P. 216**
Presintering heat treatment found to prevent cracking in silica-fiber billets used to make thermally-insulating tiles.

B83-10589
CATALYTIC COAL LIQUEFACTION WITH IRON SULFATE
S. A. QADER (CALTECH)
Nov. 1984
NPO-15727 **Vol. 8, No. 2, P. 216**
Very high conversion yields demonstrated with iron sulfate used in solution with water or solvent to impregnate coal.

B83-10590
SAMPLING OF SILICON POWDER FOR IMPURITY ANALYSIS
K. A. YAMAKAWA (CALTECH) and O. R. MCCULLOUGH (CALTECH)
Nov. 1984
NPO-15840 **Vol. 8, No. 2, P. 216**
Electron beam forms dense pellets of powdered silicon for Zeeman analysis. Sampling method focuses electron beam on submicron silicon powder. Process enhances quality control in production of low-cost silicon powder for semiconductor industry.

B83-10591
SILANE PYROLYSIS WITH SILICON-SEED AEROSOL
R. C. FLAGAN (CALTECH) and M. K. ALAM (CALTECH)
Nov. 1984
NPO-16054 **Vol. 8, No. 2, P. 217**
Large silicon particles result from controlled pyrolysis of silane. Mixture of 1 percent silane in nitrogen pyrolyzed at 300 degrees C to generate aerosol of silicon seed particles.

B83-10592
AUTOMATED MAGNETIC SUSCEPTIBILITY ANALYSIS
T. J. RATHZ
Nov. 1984
MFS-25935 **Vol. 8, No. 2, P. 217**
Microprocessor-controlled susceptometer measures cryogenic temperature dependence of ac magnetic susceptibility of small cylindrical samples.

B83-10593
REMOVING SULFUR DIOXIDE FROM FLUE GASES
G. R. GAVALAS (CALTECH) and M. F. STEPHANOPOULOS (CALTECH)
Nov. 1984

NPO-15758 **Vol. 8, No. 2, P. 217**
In situ removal of SO2 in flue gases and fluidized-coal combustors, with no waste product possible using NaO/LiO as regenerable supported molten sorbent.

B83-10594
X-RAY-DIFFRACTION ANALYSIS OF NB/GE ALLOYS
J. H. DAVIS (University of Alabama) and K. HOUSE (University of Alabama)
Nov. 1984
MFS-27038 **Vol. 8, No. 2, P. 217**
Investigation of series of niobium/germanium alloys produced by supercooling discussed in report.

B83-10595
CONDUCTIVE PLASMA-SPRAYED COATINGS
V. F. HRIBAR (CALTECH)
Nov. 1984
NPO-15927 **Vol. 8, No. 2, P. 217**
Normal emittance of oxidized titanium foil used as plume shields at high temperature significantly increased by plasma coating with specific ceramic materials.

B83-10596
HIGH-TEMPERATURE, LOW-GRAVITY CASTING FURNACE
H. M. KING, J. R. SHORT, R. E. SHURNEY, T. F. MORRIS, R. A. PARR, M. H. JOHNSTON, and D. D. WEBB
Nov. 1984
MFS-25605 **Vol. 8, No. 2, P. 217**
Up to six different samples processed. Experimental melting and casting furnace designed to perform metallurgical studies in low gravity.

B83-10597
FURNACE FOR RAPID HEATING AND COOLING
R. M. POORMAN
Nov. 1984
MFS-25707 **Vol. 8, No. 2, P. 218**
Furnace heats specimen to above 1,200 degrees C and then cools it to below 900 degrees C in just a few minutes. Compressed solid reactant provides heat; liquid carbon dioxide provides cold.

05 LIFE SCIENCES

B83-10045
HEART-RATE AND BREATH-RATE MONITOR
T. G. COOPER (Narco Scientific)
Aug. 1983
MSC-20078 **Vol. 7, No. 3, P. 289**
Circuit requiring only four integrated circuits (IC's) measures both heart rate and breath rate. Phase-locked loops lock on heart-rate and respiration-rate input signals. Each loop IC contains two phase comparators. Positive-edge-triggered circuit used in making monitors insensitive to dutycycle variations.

B83-10046
MICROPROCESSOR-BASED NEURAL-PULSE-WAVE ANALYZER
G. K. KOJIMA and F. BRACCHI (Universita di Milano, Milan)
Aug. 1983
ARC-11388 **Vol. 7, No. 3, P. 290**
Microprocessor-based system analyzes amplitudes and rise times of neural waveforms. Displaying histograms of measured parameters helps researchers determine how many nerves contribute to signal and specify waveform characteristics of each. Results are improved noise rejection, full or partial separation of overlapping peaks, and isolation and identification of related peaks in different histograms.

B83-10164
FLOWTHROUGH BACTERIA-DETECTION SYSTEM
D. C. GRANA and J. R. WILKINS
Oct. 1983
LAR-12871 **Vol. 7, No. 4, P. 413**
Online system allows repetitive cycling of sample intake, bacteria counting and sterilization. System measures bacteria count by using sample/incubate/ measure cycle. Steps in cycle are on/off operations to cycle automated easily.

B83-10165
LIGHTWEIGHT, ECONOMICAL DEVICE ALLEVIATES DROP FOOT
B. C. DEIS
Oct. 1983
LAR-12259 **Vol. 7, No. 4, P. 414**
Corrective apparatus alleviates difficulties in walking for victims of drop foot. Elastic line attached to legband provides flexible support to toe of shoe. Device used with flat (heelless) shoes, sneakers, crepe-soled shoes, canvas shoes, and many other types of shoes not usable with short leg brace.

B83-10166
TRANSDUCER JOINT FOR KIDNEY-STONE ULTRASONICS
E. D. ANGULO
Oct. 1983
GSC-12652 **Vol. 7, No. 4, P. 415**
Ultrasonic therapy for kidney stones improved by new way of connecting wire-probe ultrasonic waveguide to transducer. Improved mounting allows joint to last long enough for effective treatment. Sheath and rubber dampers constrain lateral vibration of wire waveguide. Combination of V-shaped mounting groove, sheath, and rubber dampers increases life expectancy of wire 15 times or more.

B83-10167
SHARP-FOCUS COMPOSITE MICROSCOPE IMAGING BY COMPUTER
R. J. WALL (CALTECH)
Oct. 1983
NPO-15207 **Vol. 7, No. 4, P. 416**
Enhanced depth of focus aids medical analysis. Computer image-processing system synthesizes sharply-focused composite picture from series of photomicrographs of same object taken at different depths. Computer rejects blured parts of each photomicrograph. Remaining in focus portions form focused composite. System used to study alveolar lung tissue and has applications in medicine and physical sciences.

B83-10367
ACOUSTIC TOOTH CLEANER
J. S. HEYMAN
Apr. 1984
LAR-12471 **Vol. 8, No. 1, P. 69**
Acoustically-energized water jet aids in plaque breakdown. Acoustic Wand includes acoustic transducer 1/4 wave plate, and tapered cone. Together elements energize solution of water containing mild abrasive injected into mouth to help prevent calculous buildup.

B83-10368
AUTOMATED COLIFORM ANALYSIS
K. NISHIOKA, D. NIBLEY (The Boeing Co.), E. JEFFERS (The Boeing Co.), and R. BROOKS (The Boeing Co.)
Apr. 1984
ARC-11322 **Vol. 8, No. 1, P. 70**
Hydrogen evolved by coliform bacteria transferred to

separate measurement cell. Electroanalytic cell mounted in insulated temperature-control bath cycled between culturing temperature and sterilizing temperature. Flow of materials into and out of cell controlled by electrically operated valves.

B83-10369
ADJUSTABLE WALKER FOR THE HANDICAPPED
R. G. KITTS
Apr. 1984
LAR-12990 **Vol. 8, No. 1, P. 71**
Front legs adjust at touch of lever for use on stairs or ramps. Spring loaded legs extend when lever is depressed by user. Legs lock in position when lever is released. Lever mounted on either side of walker or on both sides, so legs operated independently.

B83-10370
REMOVING BIOSTATIC AGENTS FROM FERMENTATION SOLUTIONS
E. R. DU FRESNE (CALTECH)
Apr. 1984
NPO-15806 **Vol. 8, No. 1, P. 72**
Liquid carbon dioxide inexpensive solvent. Inexpensive process proposed for removing such poisons as furfural and related compounds from fermentation baths of biomass hydrolysates. New process based on use of liquid carbon dioxide as extraction solvent. Liquid CO2 preferable to such other liquid solvents as ether or methylene chloride.

B83-10371
COMPUTER ANALYSIS OF EYE BLOOD-VESSEL IMAGES
R. J. WALL (CALTECH) and B. S. WHITE (CALTECH)
Apr. 1984
NPO-15527 **Vol. 8, No. 1, P. 72**
Technique rapidly diagnoses diabetes mellitus. Photographs of 'whites' of patients' eyes scanned by computerized image analyzer programmed to quantify density of small blood vessels in conjuctiva. Comparison with data base of known normal and diabetic patients facilitates rapid diagnosis.

B83-10372
INFLATABLE RESCUE CAPSULES
J. L. BAKER
Apr. 1984
MFS-25677 **Vol. 8, No. 1, P. 72**
Rescue spheres transfer people from disabled vehicle to rescue vehicle. Container, inflatable sphere, constructed of gastight thermalprotective fabric to provide protection during transfer.

B83-10598
HIGH-FLOW ASYMMETRIC REVERSE-OSMOSIS MEMBRANES
M. C. KATZ and T. J. WYDEVEN
Nov. 1984
ARC-11359 **Vol. 8, No. 2, P. 221**
Water-soluble polymer membrane insolubilized by transition-metal salt. Thin layer of lower permeability material joined with thicker layer of highpermeability material. Two layers chemically identical or chemically distinct. They differ in density, compactness or other respects. Used to purify or desalinate seawater, brackish water, or industrial or domestic wastewater.

B83-10599
SOLVENT EXTRACTION OF FURFURAL FROM BIOMASS
M. F. HUMPHREY (CALTECH)
Nov. 1984
NPO-15987 **Vol. 8, No. 2, P. 222**
Solvent-extraction method reduces energy required to remove furfural produced during acid hydrolysis of biomass. Acid hydrolysis performed in vessel containing both solvents and reacting ingredients. With intimate contact between solvents and aqueous hydrolyis liqour, furfural removed form liquor almost as fast as it forms.

B83-10600
SPECULATION ON ULTRASONIC DISINTEGRATION OF ARTERIAL DEPOSITS
J. M. CLEMONS and D. M. KORNFELD
Nov. 1984
MFS-25161 **Vol. 8, No. 2, P. 222**
Small ultrasonic probe, in conjunction with aspirator breaks up and removes atherosclerotic plaque from insides of arteries.

B83-10601
YEASTS WITH INCREASED GLYCOGEN LEVELS
M. N. DASTOOR (CALTECH), G. R. PETERSEN (CALTECH), W. W. SCHUBERT (CALTECH), and B. O. STOKES (CALTECH)
Nov. 1984
NPO-15571 **Vol. 8, No. 2, P. 222**
Chemical/biological process produces single-cell food from waste carbon dioxide and hydrogen. Used in reactor for producing single-cell food.

06 MECHANICS

B83-10047
INSTRUMENT MEASURES AIRFLOW FRICTION WITHOUT CONTACT
D. J. MONSON
Aug. 1983
ARC-11354 **Vol. 7, No. 3, P. 293**
Dual beam laser interferometer determines airflow friction against body by measuring time-varying thickness of wind sheared oil film. Measurements yield skin friction between film and airstream. Errors from prerun oil flow, tunnel starting transients, and initial surface waves therefore eliminated.

B83-10048
REDUCED AIRCRAFT-ENGINE NOISE
H. K. TANNA (Lockheed Corp.), W. H. BROWN (Lockheed Corp.), and C. K. TAM (Lockheed Corp.)
Aug. 1983 See Also NASA CR-3454 (N81-30908/NSP)
LAR-12890 **Vol. 7, No, 3, P. 294**
Shock structure modified to eliminate associated noise. Shock wave repeats in supersonic flow adjoining subsonic flow layer. When supersonic layer is added, shock wave is partially transmitted at interface. Result is almost total elimination of shock pattern after one or two reflections. Technique applicable to inverted as well as to normal-velocity-profile coannular jets and used to eliminate or reduce shock noise of turbojet engines.

B83-10049
NOISE CONTROL IN PROPELLER-DRIVEN AIRCRAFT
D. C. RENNISON (Bolt Beranek and Newman, Inc.) and J. F. WILBY (Bolt Beranek and Newman, Inc.)
Aug. 1983 See Also NASA CR-159200(N80-25102/NSP)
LAR-12954 **Vol. 7, No, 3, P. 295**
Analytical model predicts noise levels inside propeller-driven aircraft during cruise at mach 0.8. Double wall sidewalls minimize interior noise and weight. Model applied to three aircraft with fuselages of different size (wide-body, narrow-body, and small-diameter) to determine noise reductions required to achieve A-weighted sound level not to exceed 80 dB.

B83-10050
DISCRIMINATING BETWEEN LIQUID AND GAS FLOWS
C. M. BERDAHL (CALTECH)
Aug. 1983
NPO-15531 **Vol. 7, No, 3, P. 295**
Flow sensor distingulshes flowing gases from liquids. Sensor allows liquids to pass, but would signal valve to turn off flow of gases. Concept developed for propulsion systems in which liquid fuel is forced out of storage tank by high-pressure gas. Controller stops flow of gas from fuel tank after liquid has been depleted.

B83-10051
SHELL-TILE THERMAL-PROTECTION SYSTEM
I. O. MACCONOCHIE, A. G. LOWSON, and H. N. KELLY
Aug. 1983
LAR-12862 **Vol. 7, No, 3, P. 296**
Durable shell-tile thermal-protection system consists of interlocking upper and lower hard caps, incorporating appropriate stiffeners and enclosing lightweight fibrous insulation. New shell tile more durable than reusable surface insulation (RSI) currently used on Space Shuttle orbiter.

B83-10052
CHECKING SURFACE CONTOURS
D. VELEGA (Beech Aircraft Corp.)
Aug. 1983
MSC-20318 **Vol. 7, No. 3, P. 297**
Rubber Impressions viewed with optical comparator. Simple mold constructed from aluminum sheet or any other easily shaped material compatible with silicone rubber ingredients. Mold placed over surface to be measured. Newly-mixed silicone rubber compound poured in mold and allowed to cure.

B83-10053
ELECTRICAL DISSIPATION MEASUREMENT OF POLYMER PHASE TRANSITIONS
E. R. LONG JR. and A. SCHUSZLER II
Aug. 1983
LAR-12861 **Vol. 7, No. 3, P. 298**
Technique measures solid/solid, glass/rubber, and liquid/liquid transition temperatures in polymers having dipole moments. Technique based on change in dipole packing that occurs with each transition and measured as change in electrical dissipation factor. Change in dipole packing occuring with each transition sensed by effect on dissipation factor.

B83-10054
DETERMINING THE ORIENTATION OF ANISOTROPIC MATERIALS
F. E. SUGG (Rockwell International Corp.) and P. J. HODGETTS (Rockwell International Corp.)
Aug. 1983
MSC-20229 **Vol. 7, No. 3, P. 299**
Ultrasonics probe direction of tile fibers. Hand-held acoustic transducer determines fiber orientation of heat resistant tiles. Transducers head placed on outer surface of painted tile. Signals from receiving transducers displayed on two-channel oscilloscope. Application suggests extending technique to inspection of other anisotropic materials. Plywood and fiber/epoxy composites examined to determine fiber direction; ultrasonics used to find direction of roll in sheet metal and other rolled products.

B83-10055
MEASURING ELASTIC MODULUS OF SINTERED METAL
R. F. FEDORS (CALTECH) and A. F. EASTMAN (CALTECH)
Aug. 1983
NPO-15589 **Vol. 7, No. 3, P. 299**
Technique minimizes effect of substrate on thin sintered coating. Uniaxial tension test yields approximate value for elastic modulus of sintered material on thin substrate. Electrode composed of central perforated nickel plated steel sheet about 4 mils (0.1mm) thick, coated on each face by porous sintered nickel about 8 mils (0.2mm) thick.

B83-10056
DISPENSING SMALL MEASURED VOLUMES OF LIQUID
G. LARSON (United Space Boosters, Inc.) and J. SMITH (United Space Boosters, Inc.)
Aug. 1983
MFS-25690 **Vol. 7, No. 3, P. 300**
Dispensing unit measures, filters, and unloads oil into container. Used in automobile manufacturing to dispense antifreeze solution into radiators or oil into engines, transmissions, or differentials. Uses gaseous nitrogen to control pressure, flow rate, and quality precisely, with minimal contamination from atmosphere.

B83-10057
CHARACTERIZING SHEAR PROPERTIES OF MEMBRANES
B. SIMPSON (Lockheed Missiles & Space Co., Inc.)
Aug. 1983
MFS-25745 **Vol., 7 No. 3, P. 301**
Method devised to obtain static shear stiffness data for membranes. Shear deflection of membrane measured under various applied static shear loads, and measurements plotted. Match attempted between experimental plot and predicted load-vs.-deflections curves until best fitting theoretical curve is found.

B83-10058
MEASURING ULTRASONIC SHEAR-WAVE VELOCITY
J. NUMMELIN (Rockwell International Corp.)
Aug. 1983
MFS-19680 **Vol. 7, No. 3, P. 302**
New technique improves accuracy of measurements of ultrasonic shearwave velocity. Technique eliminates need to measure incident sound angle. Technique contains groove in which steel sphere is placed. Sphere act as reference point for measuring path lengths and propagation times. Velocity measurements are within 1 percent of published data.

B83-10059
PROBE ARRAY FOR TESTING PRINTED-CIRCUIT SUBSTRATES
A. ROISON (General Electric Co.), C. ALBERT (General Electric Co.), C. BIANCHI (General Electric Co.), and J. EHLAND (General Electric Co.)
Aug. 1983
GSC-12759 **Vol. 7, No. 3, P. 303**
Array of tiny probes tests complex printed circuit boards prior to mounting of microcircuit chips and other active and passive components. Insertion and alignment of board, performance of entire computer-controlled test, and printing of results requires about a minute; performed manually same tests require as much as 30 hours.

B83-10060
SAMPLE HOLDER FOR CRYOGENIC ADHESIVE SHEAR TEST
F. E. LEDBETTER, J. M. CLEMONS, W. T. WHITE, B. PENN, and M. L. SEMMEL
Aug. 1983
MFS-25729 **Vol. 7, No. 3, P. 304**
Five samples tested in one cooldown. Holder mounted in testing machine. Submerged in cryogenic liquid held in cryostat. Movable crosshead of testing machine moves gradually downward. Samples placed under tension, one after another, starting with top one; each sample fails in turn before next is stressed.

B83-10061
GAS-TEMPERATURE MEASUREMENT WITH MINIMAL PERTURBATION
T. S. FU (Rockwell International Corp.) and M. QUAN

(Rockwell International Corp.)
Aug. 1983
MSC-20338 **Vol. 7, No. 3, P. 305**
Method for measuring temperature of hot turbulent gases uses three heatflux calorimeters. One calorimeter measures radiative heat flux, while other two measure total heat flux (convective and radiative), at two different temperatures. Adapted for commercial uses in such operations as monitoring temperatures of flue gases, piped liquid or gaseous products, internal-combustion or jet engine exhausts.

B83-10062
TWO-DEGREE-OF-FREEDOM MOUNT SYSTEM FOR FLUTTER MODELS
M. G. FARMER
Aug. 1983 See Also NASA TM-83302 (N82-23549/NSP)
LAR-12950 **Vol. 7, No. 3, P. 306**
Flexible rods replace conventional bearing supports to minimize structural damping. Aerodynamic damping not masked by effects of mount system, making more accurate studies possible of how aerodynamic damping varies as flow over model changed. New system called PAPA.

B83-10063
MEASURING SMALL LEAK HOLES
D. E. KOCH (Rockwell International Corp.) and J. G. STEPHENSON (Rockwell International Corp.)
Aug. 1983
MSC-20113 **Vol. 7, No. 3, P. 307**
Hole sizes deduced from pressure measurements. Measuring apparatus consists of pitot tube attached to water-filled manometer. Compartment tested is pressurized with air. Pitot probe placed at known distance from leak. Dynamic pressure of jet measured at that point and static pressure measured in compartment. Useful in situations in which small leaks are tolerable but large leaks are not.

B83-10064
FLEXIBLE COUPLING FOR ANGLE TRANSDUCER
R. A. MAYO (CALTECH)
Aug. 1983
NPO-15412 **Vol. 7, No. 3, P. 308**
Flexure strips ensure parallelism between input and output shafts. Coupling essentially gimbal mounting that behaves as four-bar linkage. Creates remote phantom pivot point that remains stationary for small displacements of coupling.

B83-10065
INSTRUMENTED PICK DETECTS COAL/ROCK INTERFACE
T. WU (General Electric Co.) and J. W. ERKES (General Electric Co.)
Aug. 1983
MFS-25753 **Vol. 7, No. 3, P. 308**
Instrumented pick installed on cutting drum of coal shearer for longwall mining measures cutting force with strain-gage-bridge load cell. Force signal transmitted to remote recorder. Transmitter located in base of pick assembly. Antenna located in shadow of rotating pick. Changes in characteristics of force signals from pick used to determine whether pick is cutting coal or rock.

B83-10066
PORTABLE PALLET-WEIGHING APPARATUS
R. M. DAY
Aug. 1983
GSC-12789 **Vol. 7, No. 3, P. 309**
Portable apparatus intended for standard four-trunnion pallets readily adaptable to any large payload or other loads where shifting of cargo is to be avoided. Device lifts trunnion of pallet short distance above its resting place. Weight at trunnion applied to load cell. Similar units placed at all four trunnions.

B83-10067
PROPOSED SHORT-THROAT SUPERSONIC NOZZLES
W. R. WAGNER (Rockwell International Corp.) and G. H. RATEKIN (Rockwell International Corp.)
Aug. 1983
MFS-19759 **Vol. 7, No. 3, P. 310**
Numerical procedure analyzes mach numbers along wall and in flow field, wall pressures, gas temperatures, and nozzle-throat discharge coefficients. Nozzles used in turbines, jet engines, magnetohydrodynamic systems, laser systems and other supersonic-flow devices.

B83-10068
SIMPLIFIED MODELING OF TETRAHEDRAL TRUSSES
A. LEONDIS (General Dynamics Corp.)
Aug. 1983
LAR-12815 **Vol. 7, No. 3., P. 312**
Tetrahedral-lattice structure exhibits great complexity in mathematical analysis, and complexity quickly increases with number of elements. Solutions for static and dynamic behavior of structure obtained with model consisting of analogous structure with fewer repeating elements. Advantage of continuum models is analytic solutions can be obtained, either in closed form or in relatively-tractable Taylor series.

B83-10069
IMPROVING A GUARDED HOTPLATE
D. CHAFEY (Lockheed Missiles & Space Co.) and G. C. HENNESSEE (Lockheed Missiles & Space Co.)
Aug. 1983
MSC-20447 **Vol. 7, No, 3. P. 312**
Modified outer guard ring heated more uniformly. Outer guard ring includes six compressible sheets of thin fibrous-ceramic paper that form thermal barrier to outward heat flow. Ceramic paper presses heating coils against ring allowing ring to be more uniformly heated.

B83-10070
TASK BOARD TESTS MANIPULATOR PERFORMANCE
J. W. HILL (SRI International)
Aug. 1983
NPO-15150 **Vol. 7, No, 3. P. 313**
Task board constructed to facilitate time-and-motion studies for remote manipulators. Apparatus equipped with holes, objects of various shapes to be grasped and sensors with switches to indicate contact. Useful in industrial robots programmed to assemble parts.

B83-10071
VORTEX LIFT AUGMENTATION BY SUCTION
A. H. TAYLOR, L. R. JACKSON, and J. K. HUFFMAN
Aug. 1983
LAR-12969 **Vol. 7, No, 3, P. 314**
Lift performance is improved on a 60 degrees swept Gothic wing. Vortex lift at moderate to high angles of attack on highly swept wings used to improve takeoff performance and maneuverability. New design proposed in which suction of propulsion system augments vortex. Turbofan placed at down stream end of leading-edge vortex system induces vortex to flow into inlet which delays onset of vortex breakdown.

B83-10072
TIME-DOMAIN MODAL VIBRATION IDENTIFICATION
S. R. IBRAHIM (Old Dominion University Research Foundation)
Aug. 1983
LAR-12924 **Vol. 7, No, 3, P. 314**
Ibrahim Time-Domain modal vibration identification program (ITD) uses multiple free-decay responses of test structure directly in time domain to identify modal parameters of structure: natural frequencies, damping factors and damped mode shapes. ITD written in FORTRAN.

B83-10073
THERMAL RADIATION MODEL RENODALIZATION
D. J. RUSSELL (Rockwell International Corp.)
Aug. 1983
MSC-20348 **Vol. 7, No, 3, P. 314**
Thermal Radiation Model Renodalization program redefines thermal model nodal geometry subsequent to generation of radiation interchange data. Program readily used with TRASYS thermal radiation program and SINDA thermal analyzer program. Program written in FORTRAN V.

B83-10074
MONTE CARLO INVESTIGATION OF TRAJECTORIES
A. B. GLASS (Computer Sciences Corp.)
Aug. 1983
GSC-12705 **Vol. 7, No. 3, P. 315**
Monte Carlo Investigation of Trajectory Operations and Requirements (MONITOR) program performs spacecraft mission maneuver simulations for craft mission maneuver simulations for geosynchronous single-maneuver, and cometencounter trajectories. Used primarily to study geosynchronous missions and model trajectories of satellites deployed by Space Shuttle. Program written in FORTRAN IV.

B83-10075
CODE SOLVES THREE-DIMENSIONAL NAVIER-STOKES EQUATIONS
P. THOMAS (Lockheed Missiles and Space Co.)
Aug. 1983
LAR-12962 **Vol. 7, No, 3, P. 315**
Set of computer codes solves three-dimensional Navier-Stokes equations for flow over nonaxisymmetric nozzles. Codes compute internal and external viscous flowfield about isolated nozzle, so flow characteristics and performance of three-dimensional jet engine exhaust nozzles can be predicted. Programs written in FORTRAN IV and ASSEMBLER.

B83-10076
SHOCK FREE AIRFOIL CASCADES
D. S. DULIKRAVICH (Universities Space Research Association)
Aug. 1983
LEW-13842 **Vol. 7, No, 3, P. 316**
The CAS22 computer program developed to provide for fast design and analysis of shock free airfoil cascades. CAS22 applicable to aerodynamic analysis and transonic shock free redesign of existing two-dimensional cascades of airfoils. Program is written in FORTRAN IV.

B83-10077
PREDICTING AIRCRAFT NOISE LEVELS
B. J. CLARK
Aug. 1983
LEW-13778 **Vol. 7, No, 3, P. 316**
Computer program developed for predicting aircraft noise levels either in flight or in ground tests. Noise sources include fan inlet and exhaust jet flap (for powered lift), core (combustor), turbine and airframe. Program written in FORTRAN IV.

B83-10078
MINIMUM INDUCED DRAG OF NONPLANAR WINGS
T. J. KU (Old Dominion University Research Foundation) and J. M. KUHLMAN (Old Dominion University Research Foundation)
Aug. 1983
LAR-12925 **Vol. 7, No, 3, P. 316**
DRG program incorporates numerical optimization technique for calculating bound-circulation distribution required for minimum induced drag of nonplanar wings. DRG written in FORTRAN IV.

B83-10079
WING SUBSONIC AERODYNAMIC PERFORMANCE ESTIMATES
H. W. CARLSON (Kentron International) and K. B. WALKLEY (Kentron International)
Aug. 1983
LAR-12987 **Vol. 7, No, 3, P. 317**
Solution by iteration estimates performance of twisted and cambered wings of arbitrary planform. SUBAER based on linearized theory lifting-surface solution provides spanwise distribution of theoretical leading edge thrust, in addition to surface distribution of perturbation velocities. Program written in FORTRAN IV.

B83-10080
BOUNDARY-LAYER EQUATIONS FOR TWO-DIMENSIONAL AND AXISYMMETTRIC FLOW
J. E. HARRIS and D. K. BLANCHARD
Aug. 1983
LAR-13015 **Vol. 7, No. 3, P. 317**
In program coupled, iterative implicit finite-difference procedure solves system of equations for laminar transitional or turbulent boundary-layer flows. Program written in FORTRAN IV.

B83-10081
FAST GENERATION OF BOUNDARY-CONFORMING O-TYPE GRIDS
D. S. DULIKRAVICH
Aug. 1983
LEW-13818 **Vol. 7, No. 3, P. 317**
Algorithm generates grids for arbitrary wing-body and axial turbomachinery geometries. GRID30 based on using analytic function to generate twodimensional grids on number of coaxial axisymmetric surfaces positioned between centerbody and outer radial boundary. Program written in FORTRAN IV.

B83-10082
CALCULATING THE VORTEX LIFT EFFECT OF CAMBERED WINGS
C. E. LAN (University of Kansas Center for Research, Inc.) and J. F. CHANG (University of Kansas Center for Research, Inc.)
Aug. 1983
LAR-12985 **Vol. 7, No. 3, P. 318**
Computer program VORCAM calculates vortex-lift effect of cambered wings by suction analogy. Based on improved version of Woodward's chord plane aerodynamic panel method for subsonic and superrsonic flow. Developed specifically for cambered wings exhibitig edge-separated vortex flow, including those with leading-edge vortex flaps. Program written in FORTRAN IV.

B83-10168
ELECTRONIC DILATOMETER
C. R. STROOPE (Hughes Aircraft Co.), G. S. PLEWS (Hughes Aircraft Co.), and J. ERMLICH (Hughes Aircraft Co.)
Oct. 1983
GSC-12738 **Vol. 7, No. 4, P. 419**
Nonclamping micrometer measures small strains. Electronic dilatometer measures minute dimensional changes caused by moisture absorption in graphite/ epoxy composites. Instrument handles sample 6 inches (15 cm) long and has strain resolution of 0.1 micro-inch/inch (0.1 micron/meter). Possible to predict humidity-induced dimensional changes in items constructed of sample material.

B83-10169
TORQUE COMPENSATOR FOR MIRROR MOUNTINGS
S. D. HOWE (Hughes Aircraft Co.)
Oct. 1983
GSC-12742 **Vol. 7, No. 4, P. 420**
Device nulls flexural distributions of pivotal torques. Magnetic compensator for flexing pivot torque consists of opposing fixed and movable magnet bars. Magnetic torque varies nonlinearly as function of angle of tilt of movable

bar. Positions of fixed magnets changed to improve magnetic torque linearity.

B83-10170
CONTROLLING HEAT-EXCHANGER OUTLET TEMPERATURE
C. M. DANIELS (Rockwell International Corp.)
Oct. 1983
MFS-19667 **Vol. 7, No. 4, P. 421**

Nearly constant temperature maintained regardless of fluid flow. Mixing heated and unheated fluids ensures constant temperature at outlet of heat exchanger. Main stream fluid heated, and bypass fluid unheated. Devised to maintain constant-temperature output under varying flow rates. Used with fluids other than liquid oxygen - water for example.

B83-10171
VIBRATION-ISOLATION BENCH FOR TESTING IN VACUUM
J. C. DANKOWSKI (Hughes Aircraft Co.)
Oct. 1983
GSC-12753 **Vol. 7, No. 4, P. 421**

Precise optical systems tested without contamination. Vibration isolator is one of three such units supporting cast-iron table. Table used to test optical systems in vacuum. Isolator made from commercially available components. Scaled-down version finds wider application in electron optics or electron-beam lithography.

B83-10172
ELECTRONIC FORCE GAGE FOR WELDERS
J. W. BRADLEY (Honeywell, Inc.) and G. GATES (Honeywell, Inc.)
Oct. 1983
MFS-25798 **Vol. 7, No. 4, P. 423**

Welding force monitored in process. Electronic force gage uses strain gage on deformable member. Oscilloscope trace of welding force photographed and compared with standard trace during calibration and troubleshooting of resistance welding equipment. Adaptable to small scale resistance welding in electronics industry.

B83-10173
SWIRL DIFFUSER
W. E. SIMON (Martin Marietta Corp.)
Oct. 1983
MSC-18996 **Vol. 7, No. 4, P. 423**

Gas diffuser, based on swirling flow, dissipates incoming gas velocity in relatively short distance. Pinwheel nozzle welded to end of inlet pipe creates swirling flow. Diffuser esentially open pipe with pinwheel nozzle, pressure drop in diffuser almost same as open pipe. Applications include fuel burners in room inlets for heating and air-conditioning, and carburetors for internal-combustion engines.

B83-10174
LEAK TESTER FOR CRYOGENIC FLOWLINES
G. D. MORTENSEN (Rockwell International Corp.), J. N. OLNEY (Rockwell International Corp.), and J. M. MARDESIC (Rockwell International Corp.)
Oct. 1983
MSC-20233 **Vol. 7, No. 4, P. 425**

Gas chromatography measures leakage into cavity surrounding joint under test. System surrounds joint being tested with sealed cavity. Presence of leakage gas in cavity monitored by gas chromatograph. Leakage rate found by multiplying relative leakage gas concentration by mass flow rate of purge as into cavity.

B83-10175
CALCULATING STATIC-SEAL LEAKAGE CORRELATION
C. M. DANIELS (Rockwell International Corp.) and M. E. BURR (Rockwell International Corp.)
Oct. 1983
MFS-19674 **Vol. 7,No. 4, P. 426**

Operational leakage rates of various working fluids predicted from test data. Method converts leakage through fixed area flow passage from one set of fluid conditions to another. Correction factor improves correlation of measured engine static seal leak rate under test conditions with rate under operating conditions. Potential applications include extrapolating from test conditions to operating condition.

B83-10176
DIELECTRIC SCANNING LOCATES VOIDS IN GLASS FOAM
P. M. GAMMELL (CALTECH)
Oct. 1983
NPO-15728 **Vol. 7, No. 4, P. 426**

Capacitive probes succeed where X-ray and ultrasonic equipment do not. Crossbar switching of pairs of conductors enables detection of dielectric inhomogeneities in selected small volume elements of slab of material. Large void in sample detected as low capacitance reading for volume element containing void. Applicable in nondestructive testing of other dielectric objects for internal defects that exhibit dielectric inhomogeneities.

B83-10177
EDDY-CURRENT DAMAGE TEST FOR CARBON COMPOSITES
A. B. HAMILTON (Vought Corp.)
Oct. 1983
MSC-20358 **Vol. 7, No. 4, P. 428**

Nondestructive test method detects cracks in materials of low conductivity. Test setup includes eddycurrent unit with frequency of 2 to 20 MHz/ and storage oscilloscope. High frequency required to assure depth of penetration less than substrate thickness, to prevent thickness from influencing reading. Eddy-current analysis confirmed by visual inspection as damaged area was sectioned and evaluated.

B83-10178
MANOMETER MEASURES GAS FLOW
J. J. ROWLETTE (CALTECH)
Oct. 1983
NPO-15686 **Vol. 7, No. 4, P. 428**

Simple apparatus measures time required for gas to displace known volume of water. Apparatus determines amount of gas generated in lead/acid cell during charging by measuring time required for gas to displace measured volume of water between markes in slanted manometer.

B83-10179
J-CHANNEL LOCKS POTTING TO COMPRESSION PANEL
D. M. ROYSTER and W. A. SHEARIN JR.
Oct. 1983
LAR-12913 **Vol. 7, No. 4, P. 429**

Panel ends supported to prevent edge failure during testing. J-Channels attached to panel ends form mechanical lock with potting compound during elevated temperature tests. Not needed during room-temperature tests.

B83-10180
MEASURING SURFACE-SHEAR STRESS IN A WIND TUNNEL
F. LEMOS and H. HIGUCHI (Dynamics Technology, Inc.)
Oct. 1983 See Also NASA TM-78531(N79-14330/NSP)
ARC-11384 **Vol. 7, No. 4, P. 430**

Two-wire skin friction gage gives both magnitude and direction of mean and fluctuating stresses. Heated wires lie at surface of gage, measure airflow by cooling effect. Wires perpendicular to each other to measure flow direction as well as magnitude. Used successfully in various turbulent flow fields, including separating three-dimensional boundary layer over cone at high angle of incidence.

B83-10181
FRACTURE STRENGTH OF SILICON SOLAR CELLS
C. P. CHEN (CALTECH)

Oct. 1983
NPO-15187 **Vol. 7, No. 4, P. 431**
Tests during processing show way to reduce breakage and increase yield. Silicon wafer twisted by four equally spaced dowel pins, two pushing up and two pushing down. Uniform shear stress found along line 45 degrees from axes of two load pairs. Test helping to develop reliable information on nature and source of flows causing cell fracture.

B83-10182
ESTIMATING DESIGN LOADS IN COUPLED VIBRATING STRUCTURES
M. R. TRUBERT (CALTECH), M. A. SALAMA (CALTECH), and R. M. BAMFORD (CALTECH)
Oct. 1983 See Also JPL Publication 79-2 (N79-20177/NSP)
NPO-14872 **Vol. 7, No. 4, P. 432**
Approximate spectral analysis faster and less expensive than transient analysis. Method of vibration analysis combines separate modes of spacecraft and launcher to determine approximate conditions for resonance. Useful for analysis of any complex structure made up of substructures not coupled too closely; however important to note, method includes effect of dynamic impedance between launcher and payload.

B83-10183
MULTIVALUED-VELOCITY-FIELD MODEL OF TURBULENCE
M. A. ZAK (CALTECH)
Oct. 1983
NPO-15748 **Vol. 7, No. 4, P. 432**
Report presents multi-valued-velocity model used in calculations of turbulence formation. Developed as part of continuing study of turbulent fluid motion, model expected to evolve into comprehensive mathematical tool to explain origin and effects of turbulence. Model has great theoretical and practical value in such fields as aerodynamics, meteorology, and combustion.

B83-10184
METHODS FOR ESTIMATING PAYLOAD/VEHICLE DESIGN LOADS
J. C. CHEN (Caltech), J. A. GARBA (Caltech), M. A. SALAMA (Caltech), and M. R. TRUBERT (Caltech)
Oct. 1983
NPO-15550 **Vol. 7, No. 4, P. 433**
Several methods compared with respect to accuracy, design conservatism, and cost. Objective of survey: reduce time and expense of load calculation by selecting approximate method having sufficient accuracy for problem at hand. Methods generally applicable to dynamic load analysis in other aerospace and other vehicle/payload systems.

B83-10185
DISSOCIATED AIRFLOW EFFECTS DURING PLASMA-ARC TESTING
B. A. MILLER (Rockwell International Corp.) and J. A. BERTANI (Rockwell International Corp.)
Oct. 1983
MSC-20522 **Vol. 7, No. 4, P. 434**
Program computes heating rates and surface friction effects. COLDARC predicts heating rate and surface friction on test article during plasmaarc testing. Uses simplified frozen-flow model to represent dissociated airflow and predict heat flux and surface friction, including effects of retarded atomic recombination from test facility data. COLDARC written in FORTRAN IV.

B83-10186
SOLUTIONS OF TRANSONIC FLOW IN TURBOMACHINES
S. STAHARA (Nielson Engineering & Research, Inc.), J. ELLIOTT (Nielson Engineering & Research, Inc.), and J. SPRETTER (Nielson Engineering & Research, Inc.)
Oct. 1983
LEW-13896 **Vol. 7, No. 4, P. 434**
Accurate approximation obtained using perturbation techniques. Pertubation procedures determine highly accurate approximations to families of nonlinear solutions either continuous or discontinuous and represent variations in some arbitrary parameter. Program written in FORTRAN IV.

B83-10187
TRANSONIC, AXISYMMETRIC FLOW OVER NOZZLE AFTERBODIES WITH SUPERSONIC JET EXHAUSTS
R. G. WILMOTH
Oct. 1983
LAR-12957 **Vol. 7, No. 4, P. 434**
Predictions require less computation than Navier-Stokes solutions. RAXJET computer program predicts transonic, axisymmetric flow over nozzle afterbodies with supersonic jet exhausts and includes effects of boundarylayer displacement, separation, jet entrainment, and inviscid jet plume blockage. RAXJET written in FORTRAN IV.

B83-10188
COMPRESSIBLE STABILITY ANALYSIS CODE FOR TRANSITION PREDICTION IN THREE DIMENSIONAL BOUNDARY LAYERS.
M. R. MALIK (High Technology Corp.)
Oct. 1983
LAR-13042 **Vol. 7, No. 4, P. 435**
COSAL employs finite-difference method to solve compressible stability equations in original form. Code includes two eigenvalue search procedures. Global procedure provided for use when no initial guess available. Fast local eigenvalue search procedure provided for use when good initial guess available. COSAL written in FORTRAN IV.

B83-10189
STEADY, NONROTATING, BLADE-TO-BLADE POTENTIAL TRANSONIC CASCADE FLOW ANALYSIS CODE
D. S. DULIKRAVICH
Oct. 1983
LEW-13854 **Vol. 7, No. 4, P. 436**
CAS2D computer program numerically solves artificially time-dependent form of actual full potential equation, providing steady, nonrotating, bladeto-blade potential transonic cascade flow analysis code. CAS2D written in FORTRAN IV.

B83-10190
PANEL CODE FOR PLANAR CASCADES
E. R. MCFARLAND
Oct. 1983
LEW-13862 **Vol. 7, No. 4, P. 436**
Plane cascade flow solved using improved surface-singularity methods. Current external aerodynamic integral-equation techniques adapted for use in internal flow calculation. Inherent computational speed and flexibility of integral equation solutions make them useful for design calculations.

B83-10191
DESIGN OF MULTISTAGE AXIAL-FLOW COMPRESSORS
J. E. CROUSE and W. T. GORRELL (U.S. Army Aviation Research and Development Command)
Oct. 1983
LEW-13505 **Vol. 7, No. 4, P. 436**
Program developed for computing aerodynamic design of multistage axialflow compressor and associated blading geometry input for internal flow analysis. Aerodynamic solution gives velocity diagrams on selected streamlines of revolution at blade row edges. Program written in FORTRAN IV.

B83-10192
EXTENDED VORTEX LATTICE METHOD

J. E. LAMAR and H. E. HERBERT (Computer Sciences Corp.)
Oct. 1983
LAR-13039 **Vol. 7, No. 4, P. 437**

Extended NASA Langley Vortex Lattice Method computer program VLM, estimates subsonic aerodynamic characteristics of up to four complex planforms. Planforms include wings with variable-sweep outer panels, wings with several changes in dihedral angle across span, wings with winglets, and wing (or wings) in conjunctions with tail and/or canard. VLM written in FORTRAN IV.

B83-10193
SUBCRITICAL WING DESIGN CODE
J. M. KUHLMAN (Old Dominion University Research Foundation) and J. Y. SHU (Old Dominion University Research Foundation)
Oct. 1983
LAR-12959 **Vol. 7, No. 4, P. 437**

QUICK Interactive Graphics Analysis program, QUIAGA, displays aircraft QUICK-geometry data to aid in detection and analysis of errors. Program generates completely-analytical aircraft geometry description for use by finite difference flow codes. QUIAGA written in FORTRAN IV.

B83-10194
INTERACTIVE GRAPHICS ANALYSIS FOR AIRCRAFT DESIGN
J. C. TOWNSEND
Oct. 1983
LAR-12951 **Vol. 7, No. 4, P. 437**

Program uses higher-order far field drag minimization. Computer program WDES WDEM preliminary aerodynamic design tool for one or two interacting, subsonic lifting surfaces. Subcritical wing design code employs higher-order far-field drag minimization technique. Linearized aerodynamic theory used. Program written in FORTRAN IV.

B83-10195
OFF-DESIGN TURBINE MODELING
G. L. CONVERSE (General Electric Co.)
Oct. 1983
LEW-13674 **Vol. 7, No. 4, P. 438**

Off-design efficiency and flow function obtained from design point input data. Computer program PART improved method of representing turbine component when preforming calculations of off-design-point data to total efficiency over range of pressure ratios and speeds specified by user. PART written in FORTRAN IV.

B83-10196
AXIAL COMPRESSOR DESIGN AND ANALYSIS
J. G. WILLIAM and R. M. HEARSAY (University of Dayton)
Oct. 1983
LEW-13488 **Vol. 7, No. 4, P. 438**

Program yields blade configurations and aerodynamic flow fields. Program consists of three sections -- two blade design sections and aerodynamic section Program structured that one section used alone, or aerodynamic section used in conjunction with either or both of blading sections. Program written in FORTRAN IV.

B83-10373
MEMBRANE SWITCHES CHECK SEAL PRESSURE
P. J. HODGETTS (Rockwell International Corp.), F. H. STUCKENBERG (Rockwell International Corp.), and E. T. MORRISSEY (Rockwell International Corp.)
Apr. 1984
MSC-20468 **Vol. 8, No. 1, P. 75**

Array of flexible membrane switches used to indicate closure of seal. Switch membrane responds to pressure exerted by rigid surface on compliant sealing medium and provides switch contacts monitored electronically. Membrane switches connected in series and placed under seal. When all switches are closed lamp or LED lights up, indicating requisite seal pressure has been realized at all switch positions. Principle used to ensure integrity of seals on refrigerator and oven doors, weatherstripping, hatches, spacecraft, airplanes, and submarines.

B83-10374
EDDY-CURRENT INSPECTION OF NARROW METAL TUBES
H. H. AMBROSE (Rockwell International Corp.), R. E. KLEINT (Rockwell International Corp.), and K. E. KIRKHAM (Rockwell International Corp.)
Apr. 1984
MFS-19742 **Vol. 8, No. 1, P. 76**

Inspection technique for narrow-bore metal tubing involves use of small internal eddy-current probe. Probe consists of thin copper wire wrapped on bobbin. Probe small enough to pass through bends in tube being measured. Technique useful for strain measurements where operating conditions or inaccessibility prevent use of such conventional methods as X-ray diffraction, electrical-resistance measurements, strain gages, or holography.

B83-10375
ACOUSTIC DESIGN IMPROVES COMPOSITE IMPACT RESISTANCE
J. S. HEYMAN
Apr. 1984
LAR-12887 **Vol. 8, No. 1, P. 76**

Improved tolerance of composites to impact damage achieved using acoustic response model to characterize dynamics of damage mechanism. Model based on assumption that in addition to classical mechanical properties, damage mechanism depends on acoustic properties of composite material. Use of model results in more-impact-resistant composite structure.

B83-10376
CRYOGENIC PRESSURE SEAL FOR WIRES
J. J. CIANA (Rockwell International Corp.)
Apr. 1984
MFS-19668 **Vol. 8, No. 1, P. 77**

High-pressure-seal formed by forcing polyurethane into space surrounding wire or cable in special fitting. Wire or cable routed through fitting then through a tightly fitting cap. Wire insulation left intact. Cap filled with sealant and forced onto the fitting: this pushes sealant into fitting so it seals wire or cable in fitting as well as in cap.

B83-10377
SIMULATING ATMOSPHERIC TURBULENCE
F. B. TATOM (Engineering Analysis, Inc.) and S. R. SMITH (Engineering Analysis, Inc.)
Apr. 1984
MFS-25850 **Vol. 8, No. 1, P. 78**

Dimensionless time series for gusts and gradients calculated with model. Single-sided one-dimensional spectra obtained from Fourier analysis of simulated vertical gust. Each of four plots represents spectrum in one of four altitude bands ranging from 0 to 10 km. Model differs from most models; is nondimensional for greater generality and uses spectra with finite wave number limits. Developed to predict effects of atmospheric turbulence in horizontal and near-horizontal flight also applicable to commercial aviation.

B83-10378
ATTACHING STRAIN GAGES TO COMPOSITE MATERIALS
B. PENN, J. M. CLEMONS, F. LEDBETTER III, and W. WHITE
Apr. 1984
MFS-25867 **Vol. 8, No. 1, P. 78**

Polyurethane adhesive bonds strain gages reliably to graphite/epoxy composites. Adhesive easy to apply, used over wide temperature range (ambient to cryogenic), and applied in short time. Tests on gages bonded to composite with adhesive demonstrated reliability of attachment.

B83-10379
SUPPRESSING TRANSIENT SIDE LOADS IN SUPERSONIC NOZZLES
W. R. WAGNER (Rockwell International Corp)
Apr. 1984
MFS-19769 **Vol. 8, No. 1, P. 79**

Fins added to nozzle wall. Fins protrude from rocket nozzle wall at equal intervals about circumference. Inhibit circumferential growth of local flow separations, reducing sideways vibration of nozzle. Transient-suppressing fins helpful in rocket nozzles, jet engines, gas turbines, laser nozzles, flow diffusers, flow separators and other devices with supersonic flows.

B83-10380
TOOL RELEASES OPTICAL ELEMENTS FROM SPRING BRACKETS
J. S. GUM
Apr. 1984
GSC-12794 **Vol. 8, No. 1, P. 79**

Threaded hooks retract bracket arms holding element. Tool uses three hooks with threaded shanks mounted in ring-shaped holder to pull on tabs to release optical element. One person can easily insert or remove optical element (such as prism or lens) from spring holder or bracket with minimal risk of damage.

B83-10381
STABILITY TEST FOR TRANSIENT-TEMPERATURE CALCULATIONS
W. CAMPBELL
Apr. 1984
MFS-25803 **Vol. 8, No. 1, P. 80**

Graphical test helps assure numerical stability of calculations of transient temperature or diffusion in composite medium. Rectangular grid forms basis of two-dimensional finite-difference model for heat conduction or other diffusion like phenomena. Model enables calculation of transient heat transfer among up to four different materials that meet at grid point.

B83-10382
LIQUID-NITROGEN TEST FOR BLOCKED TUBES
W. R. WAGNER (Rockwell International Corp.)
Apr. 1984
MFS-19762 **Vol. 8, No. 1, P. 81**

Nondestructive test identifies obstructed tube in array of parallel tubes. Trickle of liquid nitrogen allowed to flow through tube array until array accumulates substantial formation of frost from moisture in air. Flow stopped and warm air introduced into inlet manifold to heat tubes in array. Tubes still frosted after others defrosted identified as obstructed tubes. Applications include inspection of flow systems having parallel legs.

B83-10383
SHEAR-PANEL TEST FIXTURE ELIMINATES CORNER STRESSES
J. J. KISS, G. L. FARLEY (Army Aviation Research and Development Command), and D. J. BAKER (Army Aviation Research and Development Command)
Apr. 1984
LAR-12930 **Vol. 8, No. 1, P. 82**

New design eliminates corner stresses while maintaining uniform stress across panel. Shear panel test fixture includes eight frames and eight corner pins. Fixture assembled in two halves with shear panel sandwiched in between. Results generated from this fixture will result in good data base for design of efficient aircraft structures and other applications.

B83-10384
HEAT-PIPE THERMAL SWITCH
S. OLLENDORF
Apr. 1984
GSC-12644 **Vol. 8, No. 1, P. 83**

New design isolates components from vibrations. Heat-pipe thermal switch controls temperature of heat source. Ball-and-socket guide rods and bellows allow relative motion of source and its heat sink and protect source from vibrations. Designed for cooling vibration-sensitive electronic components.

B83-10385
FLOW-STRAIGHTENER SLEEVE FOR PUMP VALVE
J. TOLPEN (Rockwell International Corp.)
Apr. 1984
MFS-19781 **Vol. 8, No. 1, P. 84**

Flow-straightening sleeve contains vanes in modified honeycomb pattern. Each vane curved fluid-dynamic wing that helps straighten and smooth out flow of fluid passing over it. Sleeve performs more reliably and quietly, possibility of damage to internal valve parts greatly reduced, valve life expectancy increased and time between overhauls extended.

B83-10386
ISOLATING SUPPORTS FOR X-RAY MIRRORS
L. M. COHEN (Smithsonian Astrophysical Observatory)
Apr. 1984
MFS-25904 **Vol. 8, No. 1, P. 85**

Simple concept reduces effects of gravity, temperature and magnetism. Single circumferential ring supports fused-quartz mirror in high-resolution x-ray telescope. Adaptable to such terrestrial instruments as imaging devices and spectroscopes.

B83-10387
ELECTRONICALLY-SCANNED PRESSURE SENSORS
C. F. COE, G. T. PARRA, and R. C. KAUFFMAN
Apr. 1984
ARC-11361 **Vol. 8, No. 1, P. 86**

Sensors not pneumatically switched. Electronic pressure-transducer scanning system constructed in modular form. Pressure transducer modules and analog to digital converter module small enough to fit within cavities of average-sized wind-tunnel models. All switching done electronically. Temperature controlled environment maintained within sensor modules so accuracy maintained while ambient temperature varies.

B83-10388
CRYSTAL MICROBALANCE MONITORS RELATIVE HUMIDITY
L. C. YANG (CALTECH)
Apr. 1984
NPO-15493 **Vol. 8, No. 1, P. 87**

Sensor monitors water evaporation in industrial drying processes. Measured adsorption isotherm for instrument essentially linear over entire range of relative humidity. Testing at each temperature setting less than half hour for full relative-humidity range, with estimated frequency response time less than 10 seconds. Used to measure relative humidity of ambient atmosphere near drying paper, food textile fabrics and pulp to optimize water-drying portion of processing cycle.

B83-10389
SURFACE-MOISTURE MONITORING TECHNIQUE
L. C. YANG (CALTECH)
Apr. 1984
NPO-15494 **Vol. 8, No. 1, P. 88**

Technique monitors drying of continuous sheets of thin material. Ribbon sensing element samples moisture content of web material during each rotation of roller. Change in resistivity of thermally and electrically conductive ribbon is parameter used to measure web moisture; measurements insensitive to ribbon contact pressure. Application in industrial production of sheet materials such as paper and fabric.

B83-10390
LOCOMOTIVE TRUCK DYNAMICS
R. L. BERRY (Martin Marietta Corp.) and F. E. BARONE (Martin Marietta Corp.)
Apr. 1984 See Also NASA CR-81-577 (N82-28224/NSP)
MFS-25872 **Vol. 8, No. 1, P. 89**

Commonly-used locomotive trucks tested to study and improve ride safety. Federal Railroad Administration and National Aeronautics and Space Administration jointly initiated program to study locomotive truck dynamics to improve operation safety. Final report summarizes program and truck and component tests.

B83-10391
RADIAL-CASCADE ANALYSIS
S. Y. MENG (Rockwell International Corp.)
Apr. 1984
MFS-19752 **Vol. 8, No. 1, P. 89**

Conformal mapping transforms radial cascade to axial cascade. Report describes analysis of pressure distributions on radial diffuser geometries within Space Shuttle main and preburner pumps. Analysis uses modified version of Douglas-Neuman (D-N) procedure for two-dimensional axial cascades.

B83-10392
CRASH SIMULATION AND NONLINEAR STRUCTURAL ANALYSIS
M. P. KAMAT (Virginia Polytechnic Institute and State University)
Apr. 1984
LAR-12926; LAR-12927 **Vol. 8, No. 1,P. 90**

Behavior of structures composed of trusses, frames and membranes modeled. Crash simulation analysis useful in developing understanding of multifaceted relationship between complex structural configuration, such as aircraft, and response during crash. CDC version written in FORTRAN IV.

B83-10393
PANEL ANALYSIS AND SIZING CODE
M. S. ANDERSON, W. J. STROUD, B. J. DURLING, T. R. RAU, K. W. HENNESSY, W. H. GREENE, and C. G. LOTTS (Kentron International, Inc.)
Apr. 1984
LAR-13004; LAR-13164 **Vol. 8, No. 1, P. 90**

Program valuable in analyzing and sizing filamentary composite panels. Panel Analysis and Sizing code (PASCO) for buckling and vibration analysis and sizing of prismatic structure having arbitrary cross section primarily intended for analyzing and sizing stiffened panels made of laminated orthotropic materials. PASCO written in FORTRAN IV.

B83-10394
QUICK INTERACTIVE GRAPHICS ANALYSIS
J. C. TOWNSEND
Apr. 1984
LAR-12952 **Vol. 8, No. 1, P. 91**

Cross-section and body-line plots generated for error detection and analysis. FORTRAN 77 version of QUICK Interactive Graphics Analysis program QUIAGA, performs same operations as FORTRAN IV counterpart. QUIAGA displays aircraft QUICK geometry data to aid in detection and analysis of errors. QUICK-geometry data used to generate completelyanalytical aircraft geometry description for finite difference flow codes. QUIAGA program written in FORTRAN 77.

B83-10395
TRANSONIC AIRFOIL ANALYSIS
T. L. HOLST, F. C. DOUGHERTY, K. L. GUNDY (Informatics, Inc.), S. D. THOMAS (Informatics, Inc.), J. FRICK (Informatics, Inc.), A. FERNQUIST (Informatics, Inc.), and J. ALBERT (University of Santa Clara)
Apr. 1984
ARC-11436 **Vol. 8, No. 1, P. 91**

Program uses fast iteration scheme for solving transonic flow field around arbitrary airfoils. Transonic Airfoil Analysis Computer Code, TAIR, employs fast, fully implicit algorithm to solve conservative full-potiential equation for steady transonic flow field about arbitrary airfoil immersed in subsonic free stream. TAIR written in FORTRAN IV.

B83-10396
GENERAL AVIATION SYNTHESIS PROGRAM
T. GALLOWAY, E. SCHAIRER, J. BOWLES, and M. WATERS
Apr. 1984
ARC-11434 **Vol. 8, No. 1, P. 91**

Program performs preliminary design of fixed-wing aircraft. Emphasis placed on fixed wing aircraft with propulsion systems varying from single piston engine with fixed-pitch propeller through twin turbo-prop/turbofan systems used in business or transport aircraft. GASP written in FORTRAN IV.

B83-10397
MONITORING THE THICKNESS OF COAL-CONVERSION SLAG
J. V. WALSH (CALTECH)
Apr. 1984
NPO-15371 **Vol. 8, No. 1, P. 92**

Technique adapts analogous ocean-floor-mapping technology. Existing ocean floor acoustic technology adapted for real-time monitoring of thickness and viscosity of flowing slag in coal-conversion processing.

B83-10398
MEASURING COATING THICKNESS
A. SCHAFFER (Honeywell, Inc.) and D. GATES (Honeywell, Inc.)
Apr. 1984
MFS-25633 **Vol. 8, No. 1, P. 92**

Gage measures coating thickness in holes. Gage for quickly determining coating thickness in holes on printed circuit board also used to size small holes in other applications.

B83-10399
SELF-RIGHTING OBJECTS
J. D. BURKE (CALTECH)
Apr. 1984
NPO-15023 **Vol. 8, No. 1, P. 92**

Book-shaped object always springs open with 'pages' upward. Technique devised for righting small spacecraft after landing applied terrestrially in transmitters for rescue beacons.

B83-10400
PREDICTING THERMAL CONDUCTIVITY
B. PENN, F. LEDBETTER III, and J. CLEMONS
Apr. 1984
MFS-25732 **Vol. 8, No.1, P. 93**

Empirical equation predicts thermal conductivity of composite insulators consisting of cellular, granular or fibrous material embedded in matrix of solid viscoelastic material. Application in designing custom insulators for particular environments.

B83-10401
PASSIVE MODULE FOR CRYOGENIC REFRIGERATION
W. BROOKS and P. KITTEL (National Research Council)
Apr. 1984
ARC-11263 **Vol. 8, No. 1, P. 93**

Refrigeration module with no moving parts attaches to cold plate of cryostat to reduce temperature. Module includes evaporation chamber, condenser and absorption pump.

B83-10402
DETERMINING AIRCRAFT ALTITUDE
J. J. LORRE (CALTECH)

Apr. 1984
NPO-15386 **Vol. 8, No. 1, P. 93**
Altitude of aircraft determined rapidly from comparison of digital pictures of ground taken at different times or with different exposure times.

B83-10403
DETERMINING FROST DEPTH AND DENSITY
F. HUNEDI
Apr. 1984
MFS-25754 **Vol. 8, No. 1, P. 93**
Quick determination of frost depth and density obtained without using cumbersome tools or calculations.

B83-10404
REMOTELY-ADJUSTABLE PRESSURE-CONTROL VALVE
R. B. MORROW (CALTECH)
Apr. 1984
NPO-15693 **Vol. 8, No. 1, P. 93**
Hydraulic valve designed for controlling high-pressure fluid stream with low-pressure gas for fluid includes free-floating cylindrical control piston.

B83-10405
RAIN AND DEW DETECTOR
E. G. LAUE (CALTECH)
Apr. 1984
NPO-15370 **Vol. 8, No. 1, P. 93**
Multifinger transducer actuates simple circuit that sets off alarm when moisture bridges fingers.

B83-10406
MODIFIED OSCILLOGRAPH FOR IMPACTING COMPOSITE MATERIALS
B. PENN, F. LEDBETTER III, J. M. CLEMONS, J. DANIELS, and W. WHITE
Apr. 1984
MFS-25901 **Vol. 8, No. 1, P. 94**
Commercial oscillograph imparts impact energy to elastomeric materials modified to perform same function on composites.

B83-10602
LIQUID-DROPLET RADIATIVE COOLER
K. K. KNAPP (Astro Research Corp.)
Nov. 1984
MFS-25890 **Vol. 8, No. 2, P. 225**
Large-area, low-mass radiative cooler applicable to industrial processes requiring non-contacting cooling of process fluids. Droplet-stream radiators are used to radiate away waste heat. Extensive development required to produce practical system for terrestrial use. Effects of gravity and atmosphere are to be evaluated.

B83-10603
MINIATURE AIRFLOW SENSOR
D. D. KERSHNER
Nov. 1984
LAR-13065 **Vol. 8, No. 2, P. 226**
Miniature flow-angle and airspeed sensor quickly mounted on light aircraft wing with two-sided tape since conventional sensors are restricted to large aircraft. Sensor operates as free-trailing wind vane selfalineing in airstream through two independent axes. Vane attached to wing surface through hollow mounting boom that fits on mounting plate attached to wing with two-sided neoprene-foam tape. Method shown strong enough for loads of low-speed flight.

B83-10604
AUTOMATED MERCURY DILATOMETER
S. D. HONG (CALTECH) and V. H. CULLER (CALTECH)
Nov. 1984
NPO-14884 **Vol. 8, No. 2, P. 227**
Task of reading and recording indications of mercury dilatometer simplified by automatic system. Volume change of sample under test converted into electrical signal. Device modified by addition of resistance wire to mercury column. Height of column read indirectly by measuring resistance between terminals. Signal suitable for strip-chart recording or other processing.

B83-10605
WATERPROOF RAISED FLOOR MAKES UTILITY LINES ACCESSIBLE
M. M. COHEN
Nov. 1984
ARC-11363 **Vol. 8, No. 2, P. 228**
Floor for laboratories, hospitals and factories waterproof yet allows access to subfloor utilities. Elevated access floor system designed for installations with multitude of diverse utility systems routed under and up through floor and requirement of separation of potentially conflicting utility services. Floor covered by continuous sheet of heat resealable vinyl. Floor system cut open when changes are made in utility lines and ducts. After modifications, floor covering resealed to protect subfloor utilities from spills and leaks.

B83-10606
IN SITU MEASUREMENT OF GROUND-SURFACE FLOW RESISTIVITY
A. J. ZUCKERWAR
Nov. 1984
LAR-13053 **Vol. 8, No. 2, P. 229**
New instrument allows in situ measurement of flow resistivity on Earth's ground surface. Nonintrusive instrument includes specimen holder inserted into ground. Flow resistivity measured by monitoring compressed air passing through flow-meters; pressure gages record pressure at ground surface. Specimen holder with knife-edged inner and outer cylinders easily driven into ground. Air-stream used in measuring flow resistivity of ground enters through quick-connect fitting and exits through screen and venthole.

B83-10607
RADIALLY-GRADUATED TURBINE-TEMPERATURE PROFILE
W. R. WAGNER (Rockwell International Corp.), F. P. NITZ (Rockwell International Corp.), and M. L. STRANGELAND (Rockwell International Corp.)
Nov. 1984
MFS-19831 **Vol. 8, No. 2, P. 231**
Proposed scheme to change temperature distribution in gas-turbine flame increases radially instead of remaining spatially uniform offers important advantages. Radially increasing temperature allows higher mean gas temperature, greater power output, higher rotational speed and longer life for blades. Principle suitable for axial-flow gas turbine directly in line with cylindrical combustor. Included in category many rocket, aircraft, stationary, and shipboard turbines.

B83-10608
LONG HEAT PIPE TRANSPORTS 2.6 KW
D. M. ERNST (Thermacore, Inc.), E. H. DUBBLE (Thermacore, Inc.), and R. L. COPENHAVER (Thermacore, Inc.)
Nov. 1984
NPO-16017 **Vol. 8, No. 2, P. 231**
High-capacity heat pipe employs slender artery-and-wick structure. Ribbon of stainless steel screen wrapped around copper mandrel in conical copper forming tool. Outside edge of wrapped screen welded to layer on which it rests. Long heat pipe transports thermal energy at rate of 2,600 watts at operating temperature of 923 K.

B83-10609
INDENTIFYING BOUNDARY-LAYER TRANSITIONS ON AIRCRAFT SKIN
B. J. HOLMES, C. C. CROOM, W. C. KELLIHER, and C. J. OBARA (Kentron International, Inc.)
Nov. 1984
LAR-13089 **Vol. 8, No. 2, P. 232**

Sublimating chemicals offer accurate, low-cost way of indicating laminarto-turbulent flow transisions on surfaces of aircraft. Aerodynamic surfaces coated with thin film of such volatile chemical solids as naphthalene, diphenyl, acenaphthene, or fluorene. Film sublimes rapidly because of high local shear stress and heat transfer in boundary layer. Coating appears white in regions where chemical remained on surface indicating laminar flow; regions where chemical disappeared indicate turbulent flow.

B83-10610
INTEGRATED TACTILE SENSOR FOR ROBOTS
M. H. RAIBERT (CALTECH) and R. ESKENAZI (CALTECH)
Nov. 1984
NPO-15094 **Vol. 8, No. 2, P. 233**

Proposed large-scale integrated (LSI) circuit gives robots, partshandling machines, and remote-control devices sense of touch. LSI circuits, placed on contact surfaces of manipulators combine functions of transduction, computing and communicating. Beneath layer of pressure sensitive rubber, resistivity of which changes with pressure, electrodes furnish pressuredependent signal to computation elements. Electrodes and computation elements contained in silicon integrated-circuit wafer.

B83-10611
CONTINUOUS-READING CRYOGEN LEVEL SENSOR
F. E. BARONE (Martin Marietta Corp.), E. FOX (Martin Marietta Corp.), and S. MACUMBER (Martin Marietta Corp.)
Nov. 1984
MFS-25873 **Vol. 8, No. 2, P. 234**

Two pressure transducers used in system for measuring amount of cryogenic liquid in tank. System provides continuous measurements accurate within 0.03 percent. Sensors determine pressure in liquid and vapor in tank. Microprocessor uses pressure difference to compute mass of cryogenic liquid in tank. New system allows continuous sensing; unaffected by localized variations in composition and density as are capacitance-sensing schemes.

B83-10612
GENERAL-PURPOSE ICOSAHEDRAL STRUCTURE
J. EVANS
Nov. 1984
GSC-12854 **Vol. 8, No. 2, P. 235**

Scheme based on geodesic sphere approximated by regular icosahedron. Structure rigid and lightweight. Allows access to all subsystems and equipment from outside. Regular icosahedron constructed from triangular panels. Five panels meeting at each corner all rigidly attached to fivesided adapter. Strengthened version useful on Earth for rapidly-erectable temporary shelters, industrial structures, or playground equipment.

B83-10613
LOW-THERMAL-RESISTANCE BASEPLATE MOUNTING
W. T. PERREAULT (Martin Marietta Corp.)
Nov. 1984
MFS-25908 **Vol. 8, No. 2, P. 236**

Low-thermal-resistance mounting achieved by preloading baseplate to slight convexity with screws threaded through beam. As mounting bolts around edge of base-place tightened, baseplate and cold plate contact first in center, with region of intimate contact spreading outward as bolts tightened.

B83-10614
TEMPERATURE-AVERAGING THERMAL PROBE
L. F. KALIL and V. REINHARDT
Nov. 1984
GSC-12795 **Vol. 8, No. 2, P. 236**

Temperature-averaging thermal probe measures long-term temperature fluctuations in fluid environment. Consists of temperature probe embedded inside thermally massive material. Probe measurements used to estimate powerplant heating and cooling loads, map temperature profiles, and calibrate more-sensitive temperature probes.

B83-10615
AUTOCOVARIANCE COMPUTER
J. F. MEYERS and T. E. HEPNER (U.S. Army Aviation Research and Development Command)
Nov. 1984
LAR-12968 **Vol. 8, No. 2, P. 237**

Laser-velocimeter covariance processor calculates autocovariance and cross-covariance functions for turbulent flow field, based on Poissonsampled measurements in time from laser velocimeter. Hardware implementation of correlation technique to laser velocimeter flow-field diagnostic system fast enough for online production applications.

B83-10616
PREDICTING NOISE IN COMPLEX AIRCRAFT STRUCTURES
J. F. UNRUH (Southwest Research Institute) and D. C. SCHEIDT (Southwest Research Institute)
Nov. 1984 See Also NASA CR-3427 (N81-25766/NSP)
LAR-13032 **Vol. 8, No. 2, P. 238**

Technique combines theoretical and empirical aspects of structural components. Experimental and analytical program produces test and analysis procedures for predicting extent of noise generated in aircraft. Purpose of program to develop ways of screening candidate materials considered for noise control and establish test procedures for verifying choice of particular control measure.

B83-10617
COOLDOWN STRATEGY FOR CRYOGENIC WIND TUNNELS
J. J. THIBODEAUX
Nov. 1984 See Also NASA TM-84527 (N82-10082/NSP)
LAR-13012 **Vol. 8, No. 2, P. 238**

Criteria substantiated by experimental and real-time simulation data ensure optimal utlization of liquid nitrogen injected for cooling a 0.3-m transonic cryogenic tunnel (TCT). Research includes simulated cooldowns using procedures normally employed by each of several TCT operators, simulated cooldowns at constant mach number, simulated cooldowns at various constant fan speeds and cooldowns at constant metal-to-gas temperature differences.

B83-10618
INTERNALLY MOUNTING STRAIN GAGES
J. R. JETT JR. (Northrop Services, Inc.)
Nov. 1984
GSC-12824 **Vol. 8, No. 2, P. 239**

Technique for mounting strain gages inside bolt or cylinder simultaneously inserts gage, attached dowel segment, and length of expandable tubing. Expandable tubing holds gage in place while adhesive cures, assuring even distribution of pressure on gage and area gaged.

B83-10619
HEATER ENSURES STRAIN-GAGE BOND RELIABILITY
J. K. BROWN (Rockwell International Corp.) and M. L. DAVENPORT (Rockwell International Corp.)
Nov. 1984
MFS 19859 **Vol. 8, No. 2, P. 240**

Aluminum block with embedded heating element provides concentrated and controllable heat for curing strain-gage adhesives. Device replaces heat lamps and hot-air guns; provides higher temperatures, allows shorter curing times, and ensures more reliable bond. Low temperatures and wind do not significantly affect operation of heater, therefore suited to outdoor use.

B83-10620
MATHEMATICAL INSTABILITY CRITERIA FOR ELASTIC STRUCTURES
M. ZAK (CALTECH)
Nov. 1984

NPO-15090 **Vol. 8, No. 2, P. 240**

Theoretical paper discusses physical significance of vanishing of hyperbolic coefficients in equations of elastodynamics. Paper presents generalized approach to structural elastodynamics as part of continuing effort to develop mathematical stability criteria for structures and simulate postinstabilty behavior of elastics in general.

B83-10621

IMPROVEMENTS IN VIBRATION-ANALYSIS TECHNIQUE

R. C. ENGELS (Martin Marietta Corp.)

Nov. 1984

MFS-25919; MFS-25920 **Vol. 8, No. 2, P. 241**

Two reports present details of vibration-analysis technique. Technique scheme for accurate and efficient numerical integration of coupled equations of motion of vehicle and its payload(s). Applicable to large stationary structures, land vehicles, airplanes, ships, or wherever vibration analysis done repeatedly after each of many design changes.

B83-10622

ADVANCES IN MULTIVALUED-VELOCITY THEORY OF TURBULENCE

M. A. ZAK (CALTECH)

Nov. 1984

NPO-16006 **Vol. 8, No. 2, P. 241**

Developments reported in modeling of fluid turbulence as superposition of number of interpenetrating velocity fields. Multivalued-velocity model has practical implications in design of aircraft, turbines, nozzles, pumps, and other systems that involve turbulent flow. In both viscous and inviscid cases, equations made to predict stable regine of oscillations, both finite and independent of initial conditions as in case of real turbulence.

B83-10623

SYSTEM FOR STRUCTURAL SYNTHESIS COMBINES FINITE-ELEMENT ANALYSIS AND OPTIMIZATION PROGRAMS

J. L. ROGERS JR.

Nov. 1984

LAR-13046 **Vol. 8, No. 2, P. 242**

Programming System for Structural Synthesis, EAL/PROSSS, provides structural-synthesis capability by combining EAL and CONMIN computer programs with set of interface procedures. EAL is general-purpose finite-element structural-analysis program; CONMIN is general-purpose optimization program. User supplies two smaller problem-dependent programs to define design variables, constraints, and objective function.

B83-10624

MINIMIZING WEIGHT OF STRUCTURAL DESIGNS

L. A. SCHMIT JR. (University of California, Los Angeles) and C. FLEURY (University of California, Los Angeles)

Nov. 1984

LAR-13107 **Vol. 8, No. 2, P. 242**

Approximation Concepts Code for Efficient Structural Synthesis (ACCESS3) combines methods to offer structural system designer powerful, efficient tool for synthesis of minimum-weight designs. Approximation concepts convert general structural synthesis problem into sequence of explicit problems of separable algebraic form; dual method exploits separable form to construct sequence of explicit dual functions.

B83-10625

FREE-VIBRATION ANALYSIS OF STRUCTURES

K. K. GUPTA (CALTECH)

Nov. 1984

NPO-15797 **Vol. 8, No. 2, P. 243**

Unified numerical procedure for free-vibration analysis of structures developed and incorporated into EIGSOL computer program. Dynamic response analysis of primary importance in design of wide range of practical structures such as space-craft, buildings, and rotating machineries. Procedure determines natural frequencies and associated modes in structural design.

B83-10626

THERMAL RADIATION ANALYZER SYSTEM

J. SKLADANY

Nov. 1984

GSC-12783 **Vol. 8, No. 2, P. 243**

Thermal Radiation Analyzer System, TRASYS/II, is computer software system with generalized capability to solve radiation-related aspects of thermal-analysis problems. When used in conjunction with generalized thermalanalysis program, such as Systems Improved Numerical Differencing Analyzer (SINDA) program, any thermal problem expressed in terms of lumped-parameter RC thermal network solved.

B83-10627

MEASURING HIGH GAS TEMPERATURES

H. A. WILL

Nov. 1984

LEW-13819 **Vol. 8, No. 2, P. 243**

Program provides extrapolation calculations of high gas temperature based on theoretical heating curve of pulsed thermocouples. Program requires as input mach number. wall temperature, and total pressure in addition to thermocouple data. Tests indicate program extrapolates reasonably-accurate gas temperatures from pulsed-thermocouple data.

B83-10628

LAUNCH-WINDOW PROGRAM

J. A. ERICKSON (Computer Sciences Corp.)

Nov. 1984

GSC-12801 **Vol. 8, No. 2, P. 244**

Parameterized Investigation of Launch Opportunities and Trajectories (PILOT) program developed to perform mission simulation computations that yield data for use in delimiting optimum launch windows. CoPILOT utility program used to read and format PILOT-generated data file.

B83-10629

ANALYZING FLOW FIELDS IN AXIAL-COMPRESSOR ROTORS AND STATORS

W. J. THOMPKINS JR. (Massachusetts Institute of Technology)

Nov. 1984

LEW-13910 **Vol. 8, No. 2, P. 244**

Computer program, BLADE3D, developed for analysis of inviscid threedimensional flow fields in single blade passage of axial-compressor rotor or stator. Applicable to arbitrary axial-compressor hub, tip, and blade geometries, including blades with part-span dampers. Also used for axial turbines but with lowered resolution of flows about blunt leading and trailing edges. Analysis method valid for subsonic, transonic and supersonic flows, including choked flows.

B83-10630

GENERAL MANEUVER PROGRAM

J. A. ERICKSON (Computer Sciences Corp.)

Nov. 1984

GSC-12802 **Vol. 8, No. 2, P. 244**

General Maneuver Program, GMAN, computes both orbital and spin-axis reorientation maneuver parameters for various spacecraft. Specifically, GMAN computes detailed maneuver scenarios necessary to achieve desired orbit and attitude maneuvers. Program supports both spinning and inertially-fixed despun spacecraft and includes modeling for either hydrazine or Freon propulsion system.

B83-10631

THE MISSION RADIUS AND MANEUVERABILITY CHARACTERISTICS OF FIGHTER AIRCRAFT

W. E. FOSS JR.

Nov. 1984

LAR-12908 **Vol. 8, No. 2, P. 245**

Computer program provides detailed analysis of mission

radius and maneuverability characteristics of combat aircraft. Program combination of five mission modules representing mission profiles currently of interest. Each mission Module designed to determine combat radius or range capability for specific mission with associated ground rules and profile definitions.

B83-10632
ELLIPTICAL ORBIT PERFORMANCE COMPUTER PROGRAM
T. MYLER (Vought Corp.)
Nov. 1984
LAR-13026 **Vol. 8, No. 2, P. 245**

Elliptical Orbit Performance (ELOPE) computer program for analyzing orbital performance of space boosters uses orbit insertion data obtained from trajectory simulation to generate parametric data on apogee and perigee altitudes as function of payload data. Data used to generate presentation plots that display elliptical orbit performance capability of space booster.

B83-10633
TAKEOFF AND LANDING OF TRANSPORT AIRCRAFT
W. E. FOSS JR.
Nov. 1984
LAR-13086 **Vol. 8, No. 2, P. 245**

Computer program provides detailed analysis of takeoff and landing performance capabilities of transport-category aircraft. Performance calculated according to airworthiness standards of Federal Aviation Regulations. Program used to investigate advanced takeoff procedures for noise alleviation, such as programed throttle and control flaps.

B83-10634
ACCURACY CRITERION FOR STRUCTURAL CALCULATIONS
J. C. CHEN (CALTECH)
Nov. 1984
NPO-16008 **Vol. 8, No. 2, P. 246**

Simple method of establishing an accuracy criterion based on comparing allowable errors and modeling errors. On basis of comparison, amounts of change required to improve modeling error used in convergence criterion.

B83-10635
THERMAL AND FLOW DATA FROM LIQUID-OXYGEN SYSTEM
F. LIN, W. MOORE, and S. WALKER
Nov. 1984
KSC-11265 **Vol. 8, No. 2, P. 246**

Extensive flow rate, pressure, and temperature data available for validating computer models of liquid-oxygen transfer systems. Data on 'waterhammer' pressure spikes included.

B83-10636
LOW-SHOCK PYROTECHNIC ACTUATOR
M. H. LUCY
Nov. 1984
LAR-13198 **Vol. 8, No. 2, P. 246**

Miniature 1-ampere, 1-watt pyrotechnic actuator enclosed in flexible metal bellows. Bellows confines outgassing products, and pyrotechnic shock reduction achieved by action of bellows, gas cushion within device, and minimum use of pyrotechnic material. Actuator inexpensive, compact, and lightweight.

B83-10637
TEST FRAME SIMULATES ZERO GRAVITY
D. CHUNG (Lockheed Missiles & Space Co., Inc.) and D. LINDBERG (Lockheed Missiles & Space Co., Inc.)
Nov. 1984
MFS-25518 **Vol. 8, No. 2, P. 247**

Counterweighted frame simulates zero gravity in tests of solar-array wing. Net effect close simulation of zero-gravity environment in which wing must function. Frame also facilitates testing and replacement of solar-cell elements and panels.

B83-10638
SIMULATING A THREE-DIMENSIONAL FLOW IN PIPES
A. LEONARD and A. A. WRAY
Nov. 1984
ARC-11466 **Vol. 8, No. 2, P. 247**

Numerical method simulates in unsteady, incompressible flow in axisymmetric pipe in three dimensions. Method relies on velocity-vector expansion technique in which each vector function in expansion set is divergence-free and satisfies boundary conditions for viscous flow.

B83-10639
MICROYIELD STRESS IN COMPOSITE MATERIALS
L. MCMAHAN (Boeing Aerospace Co.) and R. POND (Boeing Aerospace Co.)
Nov. 1984
MFS-25709 **Vol. 8, No. 2, P. 247**

New interferometric method for measuring microyield stress faster and more accurate than previous strain-gage method. Multiple laser beams reflected from corner-cube reflectors arranged in triangular patterns yielding data sufficient to separate length changes from rigid-body motion and bending.

B83-10640
INSPECTING JOINTS WITH GROOVED SURFACES
B. S. BURNS
Nov. 1984
MFS-25934 **Vol. 8, No. 2, P. 247**

Method of inspecting grooved joints covers full circumference of joint at its various depths. Inspection tools include guide block that holds fiberoptic scope with camera attached to its end and also holds light pipe with ultraviolet source attached to end.

B83-10641
ANALYZING VIBRATIONS IN A LONG MAST
B. SIMPSON (Lockheed Missiles & Space Co., Inc.)
Nov. 1984
MFS-25746 **Vol. 8, No. 2, P. 247**

Report describes mathematical prediction and measurement of vibrations in light weight extensible mast of lattice structure. With mast suspended from 10 vertical wires, vibrations excited in horizontal plane by motor-driven mechanism or by hand. Vibrations recorded photographically and with accelerometers.

B83-10642
TRACKING VISIBLE TARGETS AUTOMATICALLY
R. W. ARMSTRONG (CALTECH)
Nov. 1984
NPO-15226 **Vol. 8, No. 2, P. 247**

Report summarizes techniques for automatic pointing of scientific instruments by reference to visible targets. Applications foreseen in industrial robotics. Measurement done by image analysis based on gradient edge location, image-centroid location and/or outline matching.

B83-10643
SAFE EMERGENCY EVACUATION FROM TALL STRUCTURES
E. S. STEPHAN
Nov. 1984
KSC-11225 **Vol. 8, No. 2, P. 248**

Emergency egress system allows people to be evacuated quickly from tall structures. New emergency system applicable to rescues from fires in tall hotels and other buildings. System consists of basket on slide wire. Basket descends by gravity on sloped slide wire staked to ground.

B83-10644
MATHEMATICAL SIMULATION OF FLIGHT MANEUVERS
R. B. FRAUENHOLZ (CALTECH)

Nov. 1984
NPO-15395 **Vol. 8, No. 2, P. 248**
Mathematical model simulates response of spin-stabilized spacecraft to commanded thruster pulses, using set of equations based on known inertial properties of vehicle and previously-determined thrustor performance. Model used to generate sequence of thrustor commands to accomplish specified maneuver.

B83-10645
TRACE-LEVEL SOLID-POLYMER ELECTROLYTE HYGROMETER
E. G. LAUE (CALTECH), J. B. STEPHENS (CALTECH), and M. M. L. YANG (CALTECH)
Nov. 1984
NPO-15722 **Vol. 8, No. 2, P. 248**
Water vapor absorbed by solid polymer electrolyte detected by measuring current required to electrolyze water.

B83-10646
SUBMICRON-PARTICLE GENERATOR
E. MORRISETTE and D. BUSHNELL
Nov. 1984
LAR-12785 **Vol. 8, No. 2, P. 248**
Particle generator supplies submicron-size particles to high-pressure airstream. Particles serve as light scatterers in laser velocimeter for ultra-high-speed gas. Advantage of generator: produces cloud of uniform, submicron particles at high ambient pressures and high flow rates.

B83-10647
PARTIAL-PAYLOAD SUPPORT STRUCTURE
R. MITCHELL (Brown Engineering) and M. FREEMAN (Brown Engineering)
Nov. 1984
MFS-25485 **Vol. 8, No. 2, P. 249**
Partial-payload support structure (PPSS) is modular, bridge like structure supporting experiments weighing up to 2 tons. PPSS handles such experiments more economically than standard Spacelab pallet system.

B83-10648
FATIGUE TESTING OF HEAT-EXCHANGER TUBES
P. ACKERMAN (Rockwell International Corp.)
Nov. 1984
MFS-19599 **Vol. 8, No. 2, P. 249**
Acclerated fatigue-life testing of heat-exchanger tubes simplified by technique that substitutes mechanical side load for thermally-generated axisymmetric stress. Load amplitudes adjested to produce strains equivalent to those produced by anticipated thermal stress.

B83-10649
PORTABLE FATIGUE-TESTING MACHINE
J. LEWIS (Rockwell International Corp.) and C. DAUGHERTY (Rockwell International Corp.)
Nov. 1984
MFS-19459 **Vol. 8, No. 2, P. 249**
Portable machine constructed for fatigue testing of structural materials or machinery parts subjected to fatigue loads. Piezoelectric crystal stack adds oscillatory force to constant force. Machine tests wider variety of objects than with usual rotating-beam fatigue tests.

B83-10650
BRUSHLESS LOW-SPEED DC TACHOMETER
M. B. HANDLYKKEN (CALTECH)
Nov. 1984
NPO-15706 **Vol. 8, No. 2, P. 249**
Proposed tachometer produces voltages proportional to shaft angular velocity and (by differentiation) acceleration. Coil moving in homopolar field generates emf proportional to shaft angular velocity.

B83-10651
OPTICAL TURBOPUMP SPEED SENSOR
D. SWAIN (Rockwell International Corp.)
Nov. 1984
MFS-19794 **Vol. 8, No. 2, P. 249**
Optical tachometer measures shaft rotation from outside turbopump housing. Laser-diode beam passes through quartz lens into shaft nut with alternating reflective and nonreflective surfaces. Reflected pulses collected by lens and transmitted to photodetector.

B83-10652
THEORY FOR ECCENTRIC AND MISALINED ANNULAR SEALS
E. JACKSON (Rockwell International Corp.) and W. CHEN (Rockwell International Corp.)
Nov. 1984
MFS-19892 **Vol. 8, No. 2, P. 249**
Theory describes behavior of eccentric and angularly-misalined incompressible-fluid shaft seals. Direct and cross-coupled stiffness and damping coefficients expressed in terms of degree of eccentricity and coefficients of concentric system.

B83-10653
BELLEVILLE SPRING/SEAL
D. P. BRADLEY (Rockwell International Corp.)
Nov. 1984
MFS-19596 **Vol. 8, No. 2, P. 250**
Metallic seal for cavity openings in liquid-nitrogen environments uses Belleville-spring preloaded washer. Due to preloading, Belleville spring/ seal washers slide and deflect to accept radial and axial movement between two sealing surfaces while remaining in sealing contact.

B83-10654
LEAK TEST FOR PRESSURE-SEALING ZIPPERS
E. ERICKSON (Kelly Services)
Nov. 1984
KSC-11247 **Vol. 8, No. 2, P. 250**
Test jig checks either side of pressure-sealing zippers for leaks. Procedure takes little time, and seal failure determined before zipper incorporated into suit.

B83-10655
BARRIER SELF FOR HYDRAULIC ACTUATORS
R. E. PROUT (Rockwell International Corp.) and F. MILLER (Moog, Inc.)
Nov. 1984
MSC-20390 **Vol. 8, No. 2, P. 250**
Barrier seal slows loss of pressurized hydraulic fluid due to leakage in primary seal. Barrier seal, placed downstream of primary O-ring seal, serves as secondary obstacle to leakage.

B83-10656
SUPERSONIC-NOZZLE SHOCK-WAVE ANALYSIS
W. R. WAGNER (Rockwell International Corp.) and G. H. RATEKIN (Rockwell International Corp.)
Nov. 1984
MFS-19753 **Vol. 8, No. 2, P. 250**
Analytical procedure used to modify design of high-pressure-ratio nozzles to reduce vibration during start-up and shutdown. Nozzles used in jet engines, laser nozzles and diffusers, wind tunnels, gas turbines and rocket engines.

B83-10657
NONSEPARATING HIGH-AREA-RATIO SUPERSONIC NOZZLES
W. R. WAGNER (Rockwell International Corp.) and R. R. KASSNER (Rockwell International Corp.)
Nov. 1984
MFS-19758 **Vol. 8, No. 2, P. 250**
Procedure determines supersonic-nozzle contours that allow higher nozzle-exit wall pressures, reducing chamber pressure without causing wall-flow separation as encountered in optimum large-area-ratio nozzle designs. Pro-

cedure applies to chemical-laser nozzles, jet-engine and gas turbines, wind tunnels and rocket nozzles.

07 MACHINERY

B83-10083
REMOTE MANIPULATOR HAS RELISTIC 'FEEL'
A. K. BEJCZY (CALTECH)
Aug. 1983
NPO-15065 **Vol. 7, No. 3, P. 321**

Computer aided remote manipulator does not transmit weight and inertia of its own joints and segments. Achieves load sensitivity by processing signals that move manipulator separately from those that apply reflective forces and torques on hand controller. Operator feels only load.

B83-10084
PRESSURE REDUCER FOR COAL GASIFIERS
S. KENDALL, JAMESM. (CALTECH)
Aug. 1983
NPO-15100 **Vol. 7, No. 3, P. 322**

Quasi-porous-plug pressure reducer is designed for gases containing abrasive particles. Gas used to generate high pressure steam to drive electric power generators. In giving up heat to steam, gas drops in temperature. Device used for coal gasification plants.

B83-10085
PASSIVE MAGNETIC BEARING
P. A. STUDER
Aug. 1983
GSC-12726 **Vol.7, No. 3, P. 323**

Magnetic bearing for limited rotation devices requires no feedback control system to sense and correct shaft position. Passive Magnetic Torsion Bearing requires no power supply and has no rubbing parts. Torsion wire restrains against axial instability. Magnetic flux geometry chosen to assure lateral stability with radial restoring force that maintains alignment.

B83-10086
WIND TURBINE WITH CONCENTRIC DUCTS
A. J. MUHONEN (Boeing Services International)
Aug. 1983
KSC-11191 **Vol. 7, No, 3, P. 324**

Wind Turbine device is relatively compact and efficient. Converging inner and outer ducts increase pressure difference across blades of wind turbine. Turbine shaft drives alternator housed inside exit cone. Suitable for installation on such existing structures as water towers, barns, houses, and commercial buildings.

B83-10087
ELECTROCHEMICAL DEBURRING
R. K. BURLEY (Rockwell International Corp.)
Aug. 1983
MFS-19693 **Vol. 7, No, 3, P. 324**

Electrochemical deburring removes burrs from assembled injector tubes. Since process uses liquid anodic dissolution in liquid electrolyte to proide deburring action, smoothes surfaces and edges in otherwise inaccessible areas. Tool consists of sleeve that contains metallic ring cathode. Sleeve is placed over tube, and electrolytic solution is forced to flow between tube and sleeve. The workpiece serves an anode.

B83-10088
COIL WELDING AID
W. T. WIESENBACH (Rockwell International Corp.) and M. C. CLARK (Rockwell International Corp.)
Aug. 1983
MSC-20470 **Vol. 7, No, 3, P. 325**

Positioner holds coil inside cylinder during tack welding. Welding aid spaces turns of coil inside cylinder and applies contact pressure while coil is tack-welded to cylinder. Device facilitates fabrication of heat exchangers and other structures by eliminating hand-positioning and clamping of individual coil turns.

B83-10089
GAGE MEASURES RECESSED GAPS
J. L. ZEPEDA (Rockwell International Corp.)
Aug. 1983
MSC-20230 **Vol. 7, No. 3, P. 326**

New tool measures separation between recessed parallel surfaces. Tiles have overhanging edges, tool designed to slip into gap from end so it extends through 0.040-inch crack. Measure gaps between 0.200 and 0.400 inch so gap fillers of proper thickness can be selected. Useful in numerous industrial situation involving gap measurements in inaccessable places.

B83-10090
TOOLING CONVERTS STOCK BEARINGS TO CUSTOM BEARINGS
E. N. FLEENOR JR.
Aug. 1983
LAR-12922 **Vol. 7, No. 3, P. 327**

Technique for reworking stock bearings saves time and produces helicopter-rotor bearings ground more precisely. Split tapered ring at one end of threaded bolt expands to hold inside of inner race bearing assembly; nut, at other end of bolt, adjusts amount of spring tension. Piece of hardware grasps bearing firmly without interfering with grinding operation. Operation produces bearing of higher quality than commercially available bearings.

B83-10091
DRILLING PRECISE ORIFICES AND SLOTS
C. W. RICHARDS (Marquardt Co.) and J. E. SEIDLER (Marquardt Co.)
Aug. 1983
MSC-20053 **Vol. 7, No. 3, P. 328**

Reaction control thrustor injector requires precisely machined orifices and slots. Tooling setup consists of rotary table, numerical control system and torque sensitive drill press. Components used to drill oxidizer orifices. Electric discharge machine drills fuel-feed orifices. Device automates production of identical parts so several are completed in less time than previously.

B83-10092
ROBOTIC WATER BLAST CLEANER
M. H. SHARPE, M. L. ROBERTS, W. E. HILL, and C. H. JACKSON
Aug. 1983
MFS-25519 **Vol. 7, No, 3, P. 329**

Water blasting system under development removes hard, dense, extraneous material from surfaces. High pressure pump forces water at supersonic speed through nozzle manipulated by robot. Impact of water blasts away unwanted material from workpiece rotated on air bearing turntable. Designed for removing thermal-protection material, system is adaptable to such industrial processes as cleaning iron or steel castings.

B83-10093
STAKED BEARING REMOVAL TOOL
L. A. BERSON (Rockwell International) and R. G. BIRD (Rockwell International)
Aug. 1983
MSC-20337 **Vol. 7, No. 3, P. 330**

Tool with assembled components expedites bearing replacement in aircraft, ground vehicles, and other applica-

tions. New tool cuts lip on one side to facilitate bearing replacement. After bearing retaining lip is cut away, bearing pressed out. Tool makes it possible to replace bearings without disassembling structure.

B83-10094
SELF-ALINING QUICK-CONNECT JOINT
M. H. (LUCY
Aug. 1938
LAR-12711 **Vol. 7, No. 3. P. 331**

Quick connect tapered joint used with minimum manipulation and force. Split ring retainer holds locking ring in place. Minimal force required to position male in female joint, at which time split-ring retainers are triggered to release split locking rings. Originally developed to assemble large space structures, joint is simple, compact, strong, lightweight, self alining, and has no loose parts.

B83-10095
SELF-LOCKING CONNECTOR
K. GASPAR (Rockwell International Corp.)
Aug. 1983
MFS-19716 **Vol. 7, No. 3. P. 332**

Connector lock resists vibration, automatically compensates for wear, and exhibits no backlash when parts are seated. Mechanism built into coupling nut on outer connector body. Outer collar turned clockwise to tighten treaded coupling nut, transmitting torque to coupling nut through six radially oriented pins.

B83-10096
LATCHING MECHANISM FOR UMBILICAL CONNECTORS
G. C. BURNS (McDonnell Douglas Corp.)
Aug. 1983
MSC-20242 **Vol. 7, No. 3, P. 333**

Electromechanical interface transfers electric power, data and coolant from one system to another. Motor-actuated jackscrew moves connector on active half of interface to mating connector on passive half. Originally suggested for spacecraft, concept adaptable to underwater connections.

B83-10097
REUSABLE HIGH-PRESSURE CONNECTOR
H. O. C. JENSEN (Rockwell International Corp.), H. M. MALTBY (Rockwell International Corp.), and J. A. STEIN (Rockwell International Corp.)
Aug. 1983
MSC-20339 **Vol. 7, No. 3, P. 334**

Fluid line connector for high pressure tests has split ferrule, nut, and O-ring seal. Following test, ferrule nut, and O-ring fitting are removed leaving line unaltered except for bushing braze to free end. Connector assures strong joint for high-pressure testing without redundant parts requiring postest debrazing.

B83-10098
RETAINING-RING INSTALLATION TOOL
S. CHRISTIAN (Rockwell International)
Aug. 1983
MFS-19725 **Vol. 7, No. 3, P. 334**

New tool eliminates damage to ring through improper tool use. Tool installs spiral-wound retaining rings quickly, reliably, and safely. Tool inserts rings in splined or irregularly shaped bores, bores at bottom of deep ring and slides it along bore until it nests in groove. Pistons are moved by variety of linkages.

B83-10099
MACHINING THREE PRONGS ON A SHAFT
C. HEWITT (Rockwell International)
Aug. 1983
MFS-19729 **Vol. 7, No. 3, P. 335**

Simple tool reduces set-up and machining time by more than 70 percent. Unorthodox tooling arrangement used to machine three prongs on end of specialpurpose wrench. Modified carbide-tipped spot-facing tool rotated at 1,400 to 1,600 revolutions per minute in small milling machine and applied to work piece, held with its corners in spaces of three-cornered collect.

B83-10100
SELF-CLEANING TUBULAR-MEMBRANE MODULE
M. N. SARBOLOUKI (CALTECH)
Aug. 1983
NPO-15245 **Vol. 7, No. 3, P. 335**

Tubular membranes made self-cleaning with aid of flow reversing valve. Sponge balls scrub membrane surfaces as they travel inside membrane tubes. A four-way flow-reversal valve automatically reverses flow in tubes at preset intervals so sponge balls reciprocate along tubes. Baskets at ends of tubes prevent sponges from escaping. Automatic cleaning feature added to existing membrane processing equipment with minimal modifications.

B83-10101
AIR-LUBRICATED LEAD SCREW
G. S. PERKINS (CALTECH)
Aug. 1983
NPO-15617 **Vol. 7, No. 3, P. 336**

Air lubricated lead screw and nut carefully machined to have closely matched closely fitting threads. Compressed air injected into two plenums encircle nut and flow through orifices to lubricate mating threads. Originally developed to position precisely interferometer retroreflector for airborne measurement of solar infrared radiation, device now has positioning accuracy of 0.25 micron.

B83-10102
FLOW THROUGH A ROTATING TURBOMACHINERY BLADE ROW
C. A. FARRELL JR.
Aug. 1983
LEW-13832 **Vol. 7, No. 3, P. 337**

Computer program, QSONIC, developed for calculating full potential transonic quasi-three dimensional flow through rotating turbomachinery blade row. QSONIC written in FORTRAN IV.

B83-10103
COMPRESSIBLE FLOW ABOUT WIND TURBINE BLADES
D. S. DULIKRAVICH
Aug. 1983
LEW-13740 **Vol. 7, No. 3, P. 337**

WIND program numerically solves exact full-potential equation for three dimensional, stead inviscid flow through isolated wind-turbine rotor. Proram automatically generates three dimensional, boundary-conforming grid and iteratively solves full-potential equation while fully accounting for rotating and Coriolis effects. Program written in FORTRAN IV.

B83-10104
CALCULATING THE FLOW FIELD IN A RADIAL TURBINE SCROLL
E. BASKHARONE (University of Cincinnati), S. ABDALLAH (University of Cincinnati), A. HAMED (University of Cincinnati), and W. TABAOFF (University of Cincinnati)
Aug. 1983
LEW-13437 **Vol. 7, No. 3, P. 338**

Set of two computer programs calculates flow field in radial turbine scroll. Programs represent improvement in analyzing flow in radial turbine scrolls and provide designer with tools for designing better scrolls. Programs written in FORTRAN IV.

B83-10197
COAXIAL REDUNDANT DRIVES
R. BRISSETTE (American Science & Engineering, Inc.)
Oct. 1983
MFS-25171 **Vol. 7, No. 4, P. 441**

Harmonic drives allow redundancy and high out put

torque in small package. If main drive fails, standby drive takes over and produces torque along same axis as main drive. Uses include power units in robot for internal pipeline inspection, manipulators in deep submersible probes or other applications in which redundancy protects against costly failures.

B83-10198
CRYOGENIC VACUUM PUMP
C. A. ZACHMAN (CALTECH)
Oct. 1983
NPO-15517 **Vol. 7, No. 4, P. 442**

System provides high pumping capacity even for noble gases. First stage, removes water and CO2 from input gas. Second stage, removes noble gases except helium and some lighter gases not trapped by first stage. Third stage, traps all remaining gases. All three stages mounted inside liquid-nitrogen Dewar that cools first stage. Pump small enough for general laboratory use.

B83-10199
JET ENGINES AS HIGH-CAPACITY VACUUM PUMPS
C. J. WOJCIECHOWSKI (Lockheed Missiles & Space Co., Inc.)
Oct. 1983
MFS-25791 **Vol. 7, No. 4, P. 443**

Large diffuser operations envelope and long run times possible. Jet engine driven ejector/diffuser system combines two turbojet engines and variable-area-ratio ejector in two stages. Applications in such industrial proesses as handling corrosive fumes, evaporation of milk and fruit juices, petroleum distillation, and dehydration of blood plasma and penicillin.

B83-10200
SPOOL-VALVE PRESSURE-DIFFERENCE REGULATOR
A. P. GRASSO (United Technolgoies Corp.)
Oct. 1983
MSC-20127 **Vol. 7, No. 4, P. 443**

Valves maintain preset pressure difference between gas flows. Two spool valves connected by shaft move back and forth in response to changes in pressure in oxygen and hydrogen chambers. Spool-valve assembly acts to restore pressures to preset difference. By eliminating diaphragms, pressure exerted directly on external end of spool valve; however, forces and therefore sensitivity of assembly are reduced.

B83-10201
RETRACTABLE ROTATING DOOR LATCH
R. B. CARSLEY (Rockwell International Corp.)
Oct. 1983
MSC-20304 **Vol. 7, No. 4, P. 444**

New mechanism turns door latch, latching or unlatching door, then retracts until latch is flush with surface of door frame. Concentric cylinders have cam grooves machined in surfaces. When rotated relative to each other cylinders impart rotation and translation to shaft of door latch. Motions may proceed separately or simultaneously.

B83-10202
LOCKING BOLT
B. E. BOSWELL (McDonnell Douglas Corp.)
Oct. 1983
MSC-20439 **Vol. 7, No. 4, P. 445**

Locking ball in bolt head holds wrench in place. Head of bolt contains locking ball and releases pin to grasp box wrench or other tool. Installed in cramped spaces that prevent operator from using both hands or maneuverability restricted by bulky clothing or obstacles.

B83-10203
EXPANDER FOR THIN-WALL TUBING
R. PESSIN (Rockwell International Corp.)
Oct. 1983
MFS-19739 **Vol. 7, No. 4, P. 445**

Tool locally expands small-diameter tubes. Tube expander locally expands and deforms tube: Compressive lateral stress induced in elastomeric sleeve by squeezing axially between two metal tool parts. Adaptable to situations in which tube must have small bulge for mechanical support or flow control.

B83-10204
TRANSPORTER FOR TREATED SHEET MATERIALS
M. POLLACK, H. (Fairchild Republic Co.)
Oct. 1983
MSC-20332 **Vol. 7, No. 4, P. 446**

Plastic spacers keep parts separated during transport or storage. Cart with rods and spacers holds sheets with delicate finishes for storage or transport. Sheets supported vertically by rods, or horizontally. Spacers keep sheets separated. Designed to eliminate time and expense of tapping, wrapping, and sometimes refinishing aluminum sheets with delicate anodized finished.

B83-10205
TOOL FOR GUIDING AN AUGER
C. J. WESSELSKI
Oct. 1983
MSC-20194 **Vol. 7, No. 4, P. 447**

Auger and Ram have same pitch, which minimizes damage to workpiece and load carried by auger. Auger firmly fastened onto ram shaft by screw and kept from rotating on shaft by slot machined into end of stem and male driving lug that engages slot. Used to install threaded studs in plastic or rubber where impractical to mold them in.

B83-10206
BENDER/COILER FOR TUBING
J. M. STOLTZFUS (Lockheed Corp.)
Oct. 1983
MSC-20410 **Vol. 7, No. 4, P. 448**

Easy-to-use tool makes coils of tubing. Tubing to be bend clamped with stop post. Die positioned snugly against tubing. Operator turns handle to slide die along tubing, pushing tubing into spiral groove on mandrel.

B83-10207
PLASTIC CLAMP RETAINS CLEVIS PIN
R. G. CORTES (Rockwell International Corp.)
Oct. 1983
MFS-19747 **Vol. 7, No. 4, P. 448**

Plastic clamp requires no special installation or removal tools. Clamp slips easily over end of pin. Once engaged in groove, holds pin securely. Installed and removed easily without special tools - screwdriver or putty knife adequate for prying out of groove. Used to retain bearings, rollers pulleys, other parts that rotate. Applications include slowly and intermittently rotating parts in appliances.

B83-10208
PORTABLE ROLLER STAKING TOOL
R. G. BIRD (Rockwell International Corp.) and L. A. BERSON
Oct. 1983
MSC-20281 **Vol. 7, No. 4, P. 449**

Staking tool compact and portable. Tool combines clamping and staking operations in single unit. Tool clamps workpiece (a bearing or bushing), alines it, and stakes on of flat faces. Used for most roller staking operations which acess both faces of workpiece.

B83-10209
TOOL FOR REPLACING BUSHINGS
R. G. BIRD (Rockwell International Corp.)
Oct. 1983
MSC-20282 **Vol. 7, No. 4, P. 450**

Centerlines of original bushings maintained. Tool frame extends around structure that holds bushings to be removed. Floating bushings of tool positioned with jig pin that slides

snugly in old bushing and floating tool bushings. Floating bushings then clamped to tool frame.

B83-10210
TESTING BEARINGS IN TIGHT SPACES
R. G. BIRD (Rockwell International Corp.) and L. A. BERSON
Oct. 1983
MSC-20250 **Vol. 7, No. 4, P. 451**

Portable tool checks bushings and bearings in hard-to-reach places to ensure they are properly staked. Actuator plate with surfaces at 45 degrees to hydraulic cylinder shaft turns push or pull perpendicular to original direction. Tool makes unnecessary to disassemble equipment to gain access to parts.

B83-10211
HOLDING TUBES IN PLACE FOR BRAZING
D. AMBRISCO (Rockwell International) and P. ARBINO (Rockwell International)
Oct. 1983
MFS-19658 **Vol. 7, No. 4, P. 452**

Simple method prevents loosening due to thermal mismatch. Four segment die pushed outward against tubing wall by tapered ram. Boss on each segment of die produces dimple in wall. Ram driven by commercial pneumatic cylinder powered by air at 250 psi. Method applicable to brazing of heat exchanges, thrust chambers, and other assemblies in which thermal expansion coefficients of materials differ significantly.

B83-10212
HOLDER FOR FRAGILE PARTS
L. R. HOLLAND (Athens State College)
Oct. 1983
MFS-25772 **Vol. 7, No. 4, P. 453**

Fixture with many springfingers holds irregularly-shaped parts. Gripping fixture has hundreds of springfingers, each applies minute force. Total force approximates hydrostatic pressure, resulting in well-distributed load that maintains firm grip without high stress concentrations. Applied to industrial robot manipulators, fixture enhances ability to grasp delicate parts.

B83-10213
THERMAL ELASTOHYDRODYNAMIC LUBRICATION OF SPUR GEARS
K. L. WANG (Northwestern University) and H. CHENG (Northewestern University)
Oct. 1983
LEW-13528 **Vol. 7, No. 4, P. 454**

Analysis and computer program (TELSGE) predict variations of dynamic load and surface temperature and lubricant film thickness along contacting path of pair of involute spur gears. Analysis of dynamic load includes effect of gear inertia, effect of load sharing of adjacent teeth, and effect of variable tooth stiffness obtained by element method. TELSGE written in FORTRAN IV.

B83-10407
LATCH FOR STORED CARGO
K. H. CLARK
Apr. 1984
MFS-25837 **Vol. 8, No. 1, P. 97**

Spherical latch elements distribute load over broad area. Concave and convex latching surfaces couple with one another to secure payload. Motor-drive pin locks latch in place; for active latch, second motor turns connecting plate attached to concave latch element. Spherical shape of latching elements distributes cargo weight over broad surface so no 'hotspots' when cargo secured.

B83-10408
VARIABLE-CONDUCTANCE HEAT-TRANSFER MODULE
D. R. HEWITT
Apr. 1984
GSC-12771 **Vol. 8, No. 1, P. 98**

Working lengths of heat pipes electronically controlled. Rate of heat transfer controlled by electrical heaters shorten effective working lengths of heat pipes. Concept not limited to right circular cylindrical shape. Concept adaptable to terrestrial instruments or processes in which atmospheres or fluids must be cooled and returned to instruments or processes at fixed lower temperatures.

B83-10409
THREE-FINGERED ROBOT HAND
C. F. RUOFF (CALTECH) and J. K. SALISBURY (CALTECH)
Apr. 1984
NPO-15959 **Vol. 8, No. 1, P. 99**

Mechanical joints and tendons resemble human hand. Robot hand has three 'human-like' fingers. 'Thumb' at top. Rounded tips of fingers covered with resilient material provides high friction for griping. Hand potential as prosthesis for humans.

B83-10410
EQUATIONS FOR AUTOMOTIVE-TRANSMISSION PERFORMANCE
S. CHAZANOFF (CALTECH), M. B. ASTON (CALTECH), and C. P. CHAPMAN (CALTECH)
Apr. 1984
NPO-15825 **Vol. 8, No. 1, P. 100**

Curve-fitting procedure ensures high confidence levels. Three-dimensional plot represents performance of small automatic transmission coasting in second gear. In equation for plot, PL power loss, S speed and T torque. Equations applicable to manual and automatic transmissions over wide range of speed, torque, and efficiency.

B83-10411
PORTABLE X-Y SCANNER
G. W. KURTZ and B. F. BANKSTON
Apr. 1984
MFS-25687 **Vol. 8, No. 1, P. 100**

Lightweight device uses one drive motor for surface scanning. Electromechanical X-Y Scanner indexed in both x and y by single motor. Constructed of readily available inexpensive parts. Used to move eddycurrent sensor over surface of metal plate; other applications for unique features include low power consumption, light weight, and portability.

B83-10412
HOLE-CENTER LOCATING TOOL
H. F. SENTER (Boeing Services International)
Apr. 1984
KSC-11248 **Vol. 8, No. 1, P. 101**

Tool alines center of new hold with existing hole. Tool marks center of new hole drilled while workpiece is in place. Secured with bolts while hole center marked with punch. Used for field installations where reference points unavailable or work area cramped and not easily accessible with conventional tools.

B83-10413
TOOL ENLARGES HARD-TO-REACH HOLES
J. P. GEDDES (Rockwell International Corp.)
Apr. 1984
MFS-19789 **Vol. 8, No. 1, P. 102**

Tool centers itself and cuts precise depth. Tool consists of crosscut carbide bur; sleeve that serves as depth stop and pilot; length of flexible, strong piano wire; and standard drive socket. Parts brazed together. Piano wire transmits torque and axial force to cutting tool.

B83-10414
ESTIMATING PUMP BLOCKAGE
W. CHUNG (Rockwell International Corp.), S. Y. MENG (Rockwell International Corp.), and C. Y. MENG (Rockwell International Corp.)
Apr. 1984
MFS-19763 **Vol. 8, No. 1, P. 102**

Blockage predicted for all components including induc-

ers, impellers and diffusers. Pump performance predicted by semiempirical method shows excellent agreement with test results in Space Shuttle main-engine highpressure fuel turbopump. Comparisons of pump efficiency show equally good agreement of calculated values with experimental ones. Method improves current estimation methods based solely on subjective engineering judgment.

B83-10415
WIRE RETRIEVES BROKEN PIN
G. H. BUROW (Rockwell International Corp.)
Apr. 1984
MFS-19768 **Vol. 8, No. 1, P. 103**

Safety wire retains pieces of broken tool. Retrieval wire running through shaft of tool used to pull pieces of tool out of hole, should tool break during use. Safety wire concept suitable for pins subject to deflection or breakage.

B83-10416
CONTROL-CHAIN SAFETY TRAY AND FRICTION PULL
G. HAJDIK and C. R. PEEK (Pan American World Airways, Inc.)
Apr. 1984
MSC-20401 **Vol. 8, No. 1, P. 104**

Tray mounted above suspended ceiling keeps sprinkler-system control chain safely out of way of pedestrian traffic below. Tray reached easily by using fireman's hook short stepladder, or chair or by jumping up to grasp chain. Safety tray used for infrequently used control chains on vents and dampers.

B83-10417
AUTOMATED COAL-MINE SHUTTLE CAR
E. R. COLLINS JR. (Caltech)
Apr. 1984
NPO-15850 **Vol. 8, No. 1, P. 105**

Cable-guided car increases efficiency in underground coal mines. Unmanned vehicle contains storage batteries in side panels for driving traction motors located in wheels. Batteries recharged during inactive periods or slid out as unit and replaced by fresh battery bank. Onboard generator charges batteries as car operates.

B83-10418
SHUTTLE-CAR SYSTEM FOR CONTINUOUS MINING
E. R. COLLINS JR. (Caltech)
Apr. 1984
NPO-15949 **Vol. 8, No. 1, P. 106**

Buffer storage catches coal production between loadings. Telescoping reservoir filled continuously. With tailgate down, shuttle car slides into place along sides and bottom of reservoir. Reservoir retracts along inside of car and out through tailgate, leaving coal behind in car. System not restricted to coal mining and may prove economical for hauling other solid materials.

B83-10419
MECHANICAL COAL-FACE FRACTURER
E. R. COLLINS JR. (Caltech)
Apr. 1984
NPO-15847 **Vol. 8, No. 1, P. 107**

Radial points on proposed drill bit take advantage of natural fracture planes of coal. Radial fracture points retracted during drilling and impacted by piston to fracture coal once drilling halts. Group of bits attached to array of pneumatic drivers to fracture large areas of coal face.

B83-10420
SHOCK MOUNTING FOR HEAVY MACHINES
A. R. THOMPSON (Thiokol Corp.)
Apr. 1984
MFS-25888 **Vol. 8, No. 1, P. 107**

Elastomeric bearings eliminate extraneous forces. Rocket thrust transmitted from motor to load cells via support that absorbs extraneous forces so they do not affect accuracy of thrust measurements. Adapter spoked cone fits over forward end of rocket motor. Shock mounting developed for rocket engines under test used as support for heavy machines, bridges, or towers.

B83-10421
RECIPROCATING LINEAR ELECTRIC MOTOR
M. P. GOLDOWSKY (U.S. Phillips Corp.)
Apr. 1984
GSC-12773 **Vol. 8, No. 1, P. 108**

Features include structural simplicity and good force/displacement characteristics. Reciprocating motor has simple, rugged construction, relatively low reciprocating weight, improved power delivery, and improved force control. Wear reduced by use of magnetic bearings. Intended to provide drivers for long-lived Stirling-cycle cryogenic refrigerators, concept has less exotic applications, such as fuel pumps.

B83-10422
SEGMENTED TUBULAR SEAT SPRINGS
L. A. HASLIM
Apr. 1984
ARC-11349 **Vol. 8, No. 1, P. 110**

Low-cost seat cushion made with rows of hoop springs. Springs formed from elliptical tubes by cutting most of way through on planes perpendicular to cylindrical axis. Tubular spring simplifies construction and reduce cost of seat cushions in vehicles and furniture.

B83-10423
AIR GUIDE FOR SHEET-METAL GRINDER
T. HEERMANN (Rockwell International Corp.)
Apr. 1984
MFS-19788 **Vol. 8, No. 1, P. 111**

Tool attachment reduces heat distortion of sheet. Air-guide attachment directs air from grinder motor to grinding wheel and metal sheet being ground. Cooling air reduces thermal distortion of workpiece due to localized frictional heating. Particularly useful when grinding sheet metal.

B83-10424
METERING BAFFLE FOR TURBINE-BLADE COOLING
R. MOORE (Pratt & Whitney Aircraft Group), D. E. PAULUS (Pratt & Whitney Aircraft Group), and T. S. RACKLEY (Pratt & Whitney Aircraft Group)
Apr. 1984
MFS-25849 **Vol. 8, No. 1, P. 112**

Mixing losses due to excessive film cooling reduced. Turbine blade or vane cooled by gas or liquid flowing through holes to exterior airfoil surface. Metering baffle inside airfoil controls flow to each row of cooling holes. Resulting surface-film flow keeps airfoil cool enough to operate in high-heat, high pressure turbines.

B83-10425
CONVECTION-COOLED TURBINE AIRFOILS
D. E. PAULUS (Pratt & Whitney Aircraft Group)
Apr. 1984
MFS-25848 **Vol. 8, No. 1, P. 112**

Coolant channels close to surface ensure efficient heat transfer. Advanced convection-cooled airfoil consists essentially of metal cover on grooved support structure. Grooves form coolant passages oriented in any direction. After cover material is applied, filler material removed from coolant passages form conduit for heat transfer fluid.

B83-10426
ANTIVORTEX INLET RIBS FOR FLUID-SEALS
W. C. CHEN (Rockwell International Corp.), R. F. BEATTY (Rockwell International Corp.), and E. D. JACKSON (Rockwell International Corp.)
Apr. 1984
MFS-19793 **Vol. 8, No. 1, P. 113**

Instability in rotating machinery reduced. Ring of ribs fastened to existing stator in turbopump pressure-seal inlet.

Ribs suppress swirl in flow entering seal. Rib concept offers relatively inexpensive solution to some lateral-instability problems in many other systems with rotating pressure seals.

B83-10427
BALL-AND-SOCKET-BEARING WEAR TEST
W. G. GRAHAM (Rockwell International Corp.)
Apr. 1984
MFS-19737 **Vol. 8, No. 1, P. 114**
Series of experiments to measure wear life of spherical bearing summarized. Report designed to establish clearance, contour, finish, and lubricant parameters for highly-loaded, compact plain spherical bearing. Information useful in design of bearings for helicopter control linkages, business machines, nuclear reactor, and rotor bearings.

B83-10428
BEARING WEAR IN LARGE THERMAL GRADIENTS
J. W. KANNEL (Battelle Columbus Laboratories)
Apr. 1984
MFS-25879 **Vol. 8, No. 1, P. 115**
Report presents results of study of bearing distress resulting from malfunction of spring-preloading arrangements. Study examined effect of thermal growth on wear depth of bearing. Report considers bearing-failure modes, relationships between growth and wear, maximum stresses as function of load, and effect of thermal growth on spring-load deflections.

B83-10429
CLAMP FOR ATTACHING EQUIPMENT TO AN I-BEAM
K. H. CLARK
Apr. 1984
MFS-25510 **Vol. 8, No. 1, P. 115**
Quick-connect/disconnect clamp attaches instruments or equipment to I-beam, or similar flanged structures, without use of tools or much force.

B83-10430
CONTINUOUS MINING MACHINE
T. KNUROVSKY (Caltech) and J. KISKIS (Caltech)
Apr. 1984
NPO-15164 **Vol. 8, No. 1, P. 115**
Mining machine contains two maneuverable drums for cutting coal and rock intrusion in coal seam.

B83-10431
ROOF SUPPORT NEAR COAL-MINING FACE
T. KNUROVSKY (Caltech), J. P. KISKIS (Caltech), and G. SIEGEL (Caltech)
Apr. 1984
NPO1-15165 **Vol. 8, No. 1, P. 115**
Hydraulically-powered legs mounted on crawlers and carrying sections of conveyors provide roof support close to working face and above workspace at all times.

B83-10432
BIDIRECTIONAL CONTINUOUS COAL MINER
T. KNUROVSKY (Caltech), J. P. KKISKIS (Caltech), and J. HARRIS (Caltech)
Apr. 1984
NPO-15166 **Vol. 8, No. 1, P. 116**
Continuous mining machine cuts coal in both directions of travel eliminating downtime caused by retreating across face to start new cut.

B83-10433
MINER FOR CUTTING ENTRY PASSAGES IN COAL SEAMS
T. KNUROVSKY (Caltech) and J. KISKIS (Caltech)
Apr. 1984
NPO-15167 **Vol. 8, No. 1, PP. 116**
Coal mining machine cuts swath wider than itself and cuts entry passages into coal seam in one pass.

B83-10434
DRILLING HOLES ON A LARGE BOLT CIRCLE
R. A. HIBDON (Boeing Services International)
Apr. 1984
KSC-11115 **Vol. 8, No. 1, P. 116**
Special machine tool creates circle of holes spaced and bored to accuracy of few thousandths of an inch.

B83-10435
TOOL FOR TAKING CLAY IMPRESSIONS
R. S. DUNCAN (Rockwell International Corp.)
Apr. 1984
MFS-19728 **Vol. 8, No. 1, P. 116**
Clay impression of small parts taken with tool consisting of hollow tube closed at one end. Slots at other end admit part short distance into tube. Impression used to make silicone rubber mold for examination.

B83-10436
TOOL FOR TIGHTENING BOLTS WITH KNURLED HEADS
J. G. SMITH and W. A. WALL
Apr. 1984
MFS-25694 **Vol. 8, No. 1, P. 116**
Modified clamp transfers torque to bolthead. Readily-available springloaded clamp modified, transfers measured torque to bolt with knurled head.

B83-10437
DAMPING SEALS FOR TURBOMACHINERY
G. L. VON PRAGENAU
Apr. 1984
MFS-25834 **Vol. 8, No. 1, P. 117**
Seals with rough surfaces proposed for stabilizing shaft motion and preventing leakage along shaft in machines such as turbopumps. Applicable to turbomachinery with speed limits raised and bearing life extended, avoiding costly shutdowns.

B83-10438
CONTROLLING SANDING DEPTH
C. E. FLOWERS (Rockwell International Corp.)
Apr. 1984
MFS-19713 **Vol. 8, No. 1, P. 117**
Sander mounted on traversing mechanism moved toward or away from workpiece by screw drive. Depth of sanding and position of sander on work is reliably controlled.

B83-10439
MEASURING RECESSED PINS
C. KOSTAS (Rockwell International Corp.) and W. PARKER (Rockwell International Corp.)
Apr. 1984
MFS-19673 **Vol. 8, No. 1, P. 117**
Sleeve-and-rod-tool measures distances in blind locations. Developed for measuring small distance from top of pin to body holding it.

B83-10440
LOCK FOR TUBE FITTINGS
L. A. HEIN and W. N. MYERS
Apr. 1984
MFS-25964 **Vol. 8, No. 1, P. 117**
Attachment for nuts of tube fittings locks fittings securely. Attachment includes covers for nut on tube fitting and nut on boss fitting.

B83-10441
TEST-BENCH DYNAMOMETER
G. S. PERKINS (Caltech)
Apr. 1984
NPO-15084 **Vol. 8, No. 1, P. 117**
Test bench confirms operating characteristics of motors and drive mechanisms.

B83-10442
BEARING MEASURING FIXTURE

W. D. MASON (Rockwell International Corp.)
Apr. 1984
MFS-19315 **Vol. 8, No. 1, P. 117**
Tool serves accurate base for making critical measurement of large bearing such as those in turbopumps.

B83-10443
STRIPPER FOR CABLES OF ANY CROSS SECTION
J. O. LONBORG (Caltech)
Apr. 1984
NPO-15631 **Vol. 8, No. 1, P. 118**
New wire stripper removes insulation from cable with noncircular cross sections as well as circular cross sections.

B83-10444
STAGING TWO-PHASE TURBINES
D. G. ELLIOTT (Caltech)
Apr. 1984
NPO-15037 **Vol. 8, No. 1, P. 118**
Staging method solves problem of friction loss and low efficiency of two phase (liquid/gas) flow in turbines by using high blade-tip speeds in first stage for progressively lower tip speeds in succeeding stages.

B83-10445
LOW-CONTAMINATION VIBRATING FEEDER FOR SILICON CHIPS
B. H. MACKINTOSH (Mobil Tyco Solar Energy Corp.)
Apr. 1984
NPO-15128 **Vol. 8, No. 1, P. 118**
Vibratory feeding is method of controlling flow of small oddly shaped particles. Technique applied to other materials that require contamination control by feeding material through vibrating troughs topped by particular material.

B83-10446
SELF-LOCATING LATCH
J. GIBSON and J. CALVERT
Apr. 1984
MFS-25956 **Vol. 8, No. 1, P. 118**
New latch secures fitting without displacing fitting and without regard to where on latch fitting makes intitial contact.

B83-10447
TORQUE-WRENCH EXTENSION ARM
T. J. PACALA (Caltech), D. D. TRUJILLO (Caltech), and J. B. LAUDENSLAGER (Caltech)
Apr. 1984
NPO-15495 **Vol. 8, No. 1, P. 118**
Torque-wrench extension arm makes possible to apply torque to bolt, screw, or nut inaccessible to conventional wrenches or in areas where wrench cannot be manipulated. Used in narrow pockets and behind panels and walls.

B83-10658
LOW-VIBRATION OSCILLATING COMPRESSOR
P. A. STUDER
Nov. 1984
GSC-12799 **Vol. 8, No. 2, P. 253**
Oscillating compressor momentum compensated: produces little vibration in its supporting structure. Compressure requires no lubrication and virtually free of wear. Compresses working fluids such as helium, nitrogen or chlorfluorocarbons for Stirling-cycle refrigeration or other purposes. Compressor includes two mutually opposed ferromagnetic pistons of same shape and mass. Electromagnetic flux links both pistons, causing magnetic attraction between them.

B83-10659
VERTICAL-CONTROL SUBSYSTEM FOR AUTOMATIC COAL MINING
W. R. GRIFFITHS (Miller Associates, Inc.), M. SMIRLOCK (Miller Associates, Inc.), J. APLIN (Miller Associates, Inc.), R. B. FISH (Miller Associates, Inc.), and D. FISH (Miller Associates, Inc.)
Nov. 1984
MFS-25811 **Vol. 8, No. 2, P. 254**
Guidance and control system automatically positions cutting drums of double-ended longwall shearer so they follow coal seam. System determines location of upper interface between coal and shale and continuously adjusts cutting-drum positions, upward or downward, to track undulating interface. Objective to keep cutting edges as close as practicable to interface and thus extract as much coal as possible from seam.

B83-10660
TRANSPORTABLE PUMPS COULD SAVE OIL CARGOES
R. BURNS (IMA Resources, Inc.)
Nov. 1984
MFS-25881 **Vol. 8, No. 2, P. 255**
Transportable pumps designed for firefighting used to salvage crude oil from tankships leaking, burning, or grounded. Pump incorporated into self-contained transportable module along with engine and controls. Module carried by helicopter, boat, or van to site of fire provides large quantities of water at high pressure in firefighting mode or pump oil into barge in salvage mode.

B83-10661
MEMORY-METAL ELECTROMECHANICAL ACTUATORS
C. F. RUOFF (CALTECH)
Nov. 1984
NPO-15960 **Vol. 8, No. 2, P. 256**
Electrically controlled actuator produces predetermined force, torque, or displacement without motors, solenoids, or gears. Using memory-metal elements, actuator responds to digital input without electronic digital-to-analog conversion. To prevent overheating and consequent loss of hotformed shape, each element protected by thermostat turns off current when predetermined temperature is exceeded. Memory metals used to generate fast mechanical response to electric signals.

B83-10662
DESIGNING MORE-EFFICIENT SPUR GEARS
S. H. LOEWENTHAL and N. E. ANDERSON (U.S. Army Aviation Research and Development Command)
Nov. 1984 See Also (NASA TM-81426 and NASA TM-81625
LEW-13921 **Vol. 8, No. 2, P. 257**
Relatively simple method to calculate spur-gear system power loss for wide range of gear geometries and operating conditions developed. Method used to determine design requirements for efficient gearset. Effects of spur-gear size, pitch, ratio, pitch-line velocity and load on efficiency readily predictable with method. Analysis uses simple algebraic expressions to determine gear sliding, rolling, and windage losses and incorporates approximate ball-bearing power-loss expression. Predicted results show good agreement with published data.

B83-10663
TUBE ALINEMENT FOR MACHINING
J. GARCIA (Rockwell International Corp.)
Nov. 1984
MFS-19719 **Vol. 8, No. 2, P. 258**
Tool with stepped shoulders alines tubes for machining in preparation for welding. Alinement with machine tool axis accurate to within 5 mils (0.13mm) and completed much faster than visual setup by machinist.

B83-10664
CONTROLLING THE FOCUS IN ELECTRON-BEAM WELDERS
D. I. MACFARLANE (Rockwell International Corp.) and K. W. SPIEGEL (Rockwell International Corp.)
Nov. 1984
MFS-19814 **Vol. 8, No. 2, P. 259**
Detector using two whirling wires measures focus of beam in electronbeam welder. Multiple-wire beam-sampling method provides for simple nullmeter focus indication easily

controlled by operator. Detector not only operates at high beam currents but eliminates need for oscilloscope.

B83-10666
REUSABLE RELEASE MECHANISM
J. W. BUNKER (TransTechnology Corp.) and R. S. RITCHIE (TransTechnology Corp.)
Nov. 1984
MSC-20080 **Vol. 8, No. 2, P. 261**
Slider release mechanism reusable. Bears heavy loads while latched, yet gives smooth release motion. Release effected by explosively driving perpendicular slider out of engagement with load-bearing shank. Device has potential industrial applications such as emergency release of lifting cables from helicopters, cranes and hoists.

B83-10667
INSTALLATION/REMOVAL TOOL FOR SCREW-MOUNTED COMPONENTS
J. P. ASH (Rockwell International Corp.)
Nov. 1984
MSC-20606 **Vol. 8, No. 2, P. 261**
Tweezerlike tool simplifies installation of screws in places reached only through narrow openings. With changes in size and shape, basic tool concept applicable to mounting and dismounting of transformers, sockets, terminal strips and mechanical parts. Inexpensive tool fabricated as needed by bending two pieces of steel wire. Exact size and shape selected to suit part manipulated and nature of inaccessible mounting space.

B83-10668
FEEDBACK CONTROL OF ROTOR OVERSPEED
G. B. CHURCHILL
Nov. 1984
ARC-11404 **Vol. 8, No. 2, P. 262**
Feedback system for automatically governing helicopter rotor speed promises to lessen pilot's workload, enhance maneuverability, and protect airframe. With suitable modifications, concept applied to control speed of electrical generators, automotive engines and other machinery.

B83-10669
DOUBLE-POPPET VALVE
W. C. HUBER
Nov. 1984
MSC-20627 **Vol. 8, No. 2, P. 263**
New valve design includes two poppet/seat combinations actuated simultaneously. If one fails, other continues to seal against fluid flow. Valve primarily useful for handling dangerous fluids and lighter and more compact than comparable redundant-valve systems used at present.

B83-10670
TRIPLE-SEAL VALVE
W. C. HUBER
Nov. 1984
MSC-20628 **Vol. 8, No. 2, P. 265**
Handling of poisonous, flammable, or corrosive fluids made safer by new triple-seal valve concept. Three valves assembled in series, with stem mechanism for one valve serving as body of next valve. New design lighter and more compact than conventional three-series-valve combinations used with hazardous fluids.

B83-10671
SPHERICAL-BEARING ANALYSIS PROGRAM
R. J. KLECKNER (SKF Industries)
Nov. 1984
LEW-13626 **Vol. 8, No. 2, P. 265**
Computer program SPHERBEAN, developed to predict thermomechanical performance characteristics of double-row spherical roller bearings over wide range of operating conditions. Analysis allows six degrees of freedom for each roller and three for each half of an optionally split cage. Program capabilities provide sufficient generality to allow detailed simulation of both high-speed and conventional bearing operation.

B83-10672
DEPTH GAGE FOR THREADED HOLES
M. A. KAHN (Rockwell International Corp.)
Nov. 1984
MFS-19884 **Vol. 8, No. 2, P. 266**
Tool for measuring threaded depth of tapped holes accurate and easy to use. Depth read from graduated scale on tool. Gives direct reading of depth, eliminating estimates and calculations. When tool is removed from hole, spring-loaded sleeve returns to zero.

B83-10673
STALLED-FLOW AND HEAD-LOSS MODEL FOR DIFFUSER PUMPS
S. Y. MENG (Rockwell International Corp.)
Nov. 1984
MFS-19748 **Vol. 8, No. 2, P. 266**
Modeling procedure approximates inlet transition zone (blade leading edge to blade throat) of diffuser pump as two-dimensional cascade, properties of which are well known. Model applied to stators as well as rotors. Procedure much faster than previous methods.

B83-10674
RETENTION MECHANISM FOR SPINNING OBJECTS
R. A. CLOYD
Nov. 1984
MFS-25957 **Vol. 8, No. 2, P. 266**
Mechanism enables controlled release of two rotating objects. Mechanism applicable to some kinds of motor starters, drive shafts, or other drive systems released while rotating.

B83-10675
MINIATURE ROTATOR
C. C. NEIL (RCA Corp.)
Nov. 1984
LAR-12765 **Vol. 8, No. 2, P. 267**
Device for making small, precise rotation of objects in cramped spaces consists of V-groove machined in block of aluminum (or nylon) and flat, slotted bar clamped across groove. Device used to rotate lenses until in precise alinement with optical axis of injection laser.

B83-10676
PREVENTING MOTOR DAMAGE DUE TO RAPID REVERSAL
R. FETTERS (Rockwell International Corp.)
Nov. 1984
MFS-19702 **Vol. 8, No. 2, P. 267**
Reversal switch takes more time to operate, allows gentler deceleration before reversal. Switch requires both twisting and pulling motion, giving motor time to decelerate gradually.

B83-10677
A ONE-HAND NUT AND BOLT ASSEMBLY TOOL
J. M. SPENCER (Rockwell International Corp.)
Nov. 1984
MFS-19691 **Vol. 8, No. 2, P. 267**
Special wrench speeds nut and bolt assembly when insufficient room to hold nut behind bolthole with standard tool. C-clamp shaped box-andsocket-wrench assembly holds nut on blind side in alinement to receive bolt from open side.

B83-10678
PORTABLE POWER BROACH
A. J. APPLETON (Rockwell International Corp.)
Nov. 1984
MFS-19679 **Vol. 8, No. 2, P. 267**
Tool hand-held version of larger stationary broaching machines. Equipped with fittings and hoses to connect to

power source, small enough to be carried in field or used in confined spaces.

B83-10679
PRESSURE-DRIVEN WATERFLOW CLEANING DEVICE
R. RHEA (Rockwell International Corp.) and M. GANTS (Rockwell International Corp.)
Nov. 1984
MFS-19638 **Vol. 8, No. 2, P. 267**
High-Pressure gas mixed with water effective cleaner. Expanding gas bubbles in jet give more vigor to liquid. Fluid agitation effectively used to clean small, normally inaccessible cavity or passage.

B83-10680
TEMPORARY SEALING OF CAVITIES FOR LEAK TESTING
J. LITTLE (Rockwell International Corp.)
Dec. 1984
MFS-19646 **Vol. 8, No. 2. P. 267**
Wax Seals cavity openings to permit helium leak test of cavity welds. Technique facilitates leak testing of cavities in components of larger systems not otherwise sealed off at time leak testing done.

B83-10681
TRANSFORMER AND METER TESTER
R. M. STOMS (Rockwell International Corp.)
Nov. 1984
MFS-19708 **Vol. 8, No. 2, P. 267**
Numerically-controlled 5-axis machine tool uses transformer and meter to determine and indicate whether tool is in home position, but lacks built-in test mode to check them. Tester makes possible test, and repair of components at machine rather then replace them when operation seems suspect.

B83-10682
HYDRAULIC TUBE EXPANDER
R. K. BURLEY (Rockwell International Corp.)
Nov. 1984
MFS-19731 **Vol. 8, No. 2, P. 268**
Portable hydraulic tube expander expands small, thick-walled tubes in hard-to-reach locations. Tool particularly useful in situations where mechanical expander too fragile to produce desired expansion.

B83-10683
BURNER-INJECTOR-POST TIP
W. R. WAGNER (Rockwell International Corp.) and R. SAXELBY (Rockwell International Corp.)
Nov. 1984
MFS-19827 **Vol. 8, No. 2, P. 268**
Bimetallic tips attached to injector posts improve burner performance and reliability. Tip allows excess heat generated at tip to be dissipated circumferentially and axially through thermal conduction.

B83-10684
ATTACHING CHUCK KEYS TO MACHINE TOOLS
V. RICHARDSON (Boeing Services International)
Nov. 1984
KSC-11249 **Vol. 8, No. 2, P. 268**
Chuck keys attached to portable machine tools by retracting lanyards. Lanyard held taut by recoil caddy attached to tool base. Chuck key available for use when needed and safely secured during operation of tool.

B83-10685
RETROFITTING VIBRATION DAMPERS
T. C. ADAMS (Rockwell International Corp.) and J. PREMYSL (Rockwell International Corp.)
Nov. 1984
MFS-19790 **Vol. 8, No. 2, P. 268**
Method of installing support tubes allows retrofitting of vibration-reducing elements. Tubes deform elastically as inserted and expand partially as gap becomes wider. Force-fit tubes eliminate fatigue problem.

B83-10686
WIRE ELECTRICAL-DISCHARGE MACHINING AID
T. GOLLIHUGH (Rockwell International Corp.)
Nov. 1984
MFS-19643 **Vol. 8, No. 2, P. 268**
Rerouting cutting wire by adding idler rollers allows standard wire electrical-discharge machine (WEDM) temporarily modified to permit some types of cuts otherwise blocked.

B83-10687
MOTORIZED CYROGENIC VALVE
L. SALERNO, J. VORREITER, Y. MATSUMOTO, W. VAN ARK, and A. SPIVAK (Transbay Electronics, Inc.)
Nov. 1984
ARC-11452 **Vol. 8, No. 2, P. 268**
Remotely-controlled cryogenic valve operates over temperature range from room temperature to 2 K. Valve used in helium dilution refrigerators, cryostats and adiabatic-demagnetization refrigerators.

08 FABRICATION TECHNOLOGY

B83-10105
CURVED CAPS RAISE CORRUGATION STRENGTH
R. C. DAVIS, T. T. BALES, D. M. ROYSTER, and L. R. JACKSON
Aug. 1983
LAR-12884 **Vol. 7, No. 3, P. 341**
Construction concept increases strength-to-weight ratio of corrugated panels. Flat caps are replaced by curved caps in new concept for constructing corrugated panels. Geometry utilizes curved cap for wider cap/web attachment. Beading web prevents local buckling in web while allowing maximum separation between cap strips. Geometry offers significant weight saving over conventional geometry for wide range of loading.

B83-10106
SOLAR-CELL SLIDE RULE
K. A. YAMAKAWA (CALTECH)
Aug. 1983
NPO-15646 **Vol. 7, No. 3, P. 342**
Slide rule relates efficiency, impurity types, impurity concentrations, and process types. Solar cell slide rule calculations are determination of allowable impurity concentration for nonredistributive process, determination of impurity buildup factor for redistributive process and determination of allowable impurity concentration for redistributive process.

B83-10107
ULTRASONICS AND OPTICS WOULD CONTROL SHOT SIZE
A. D. MORRISON (CALTECH)
Aug. 1983
NPO-15608 **Vol. 7, No. 3, P. 343**
Feedback system assures production of silicon shot of uniform size. Breakup of silicon stream into drops is controlled, in part, by varying frequency of vibrations imparted to stream by ultrasonic transducer. Drop size monitored by photodetector. Control method particularly advantageous in that constant size is maintained even while other process variables are changed deliberately or inadvertently. Applicable to materials other than silicon.

B83-10108
REINFORCEMENT FOR STRETCH FORMED SHEET METAL
J. B. LEA (Vought Corp.) and C. R. BAXTER (Vough Corp.)
Aug. 1983
MSC-20228 **Vol. 7, No. 3, P. 343**
Tearing of aluminum sheet metal during stretch forming prevented by flame spraying layer of aluminum on edges held in stretch-forming machine. Technique improves grip of machine on metal and reinforced sheet better able to with stand concentration of force in vicinity of grips.

B83-10109
HOT-MELT ADHESIVE ATTACHMENT SYSTEM
R. L. FOX, A. W. FRIZZELL, B. D. LITTLE, D. J. PROGAR, R. H. COULTRIP, R. H. COUCH, B. A. STEIN, J. D. BUCKLEY, T. L. ST. CLAIR, and J. R. GLEASON (AVRADCOM)
Aug. 1983
LAR-12894 **Vol. 7, No. 3, P. 344**
Adhesive system is as effective on Earth as in space. Fiberglass cloth mounted in head assembly. When adhesive reaches melt temperature head is attached to metals composites, ceramics, and other materials. Once attached, head cooled rapidly for quick stick. Used to tether tools or attach temporary scaffolding to walls, buildings, or beams.

B83-10110
HIGH-ABSORPTANCE RADIATIVE HEAT SINK
T. CAFFERTY (Hughes Aircraft Co.)
Aug. 1938
GSC-12739 **Vol. 7, No. 3, P. 345**
Absorptance of black-painted open-cell aluminum honeycomb improved by cutting honeycomb at angle or bias rather than straight across. This ensures honeycomb cavities escapes. At each reflection radiation attenuated by absorption. Applications include space-background simulators, space radiators, solar absorbers, and passive coolers for terrestrial use.

B83-10111
REWATERPROOFING SILICA TILES
L. J. LLEGER and D. C. WADE
Aug. 1983
MSC-20340 **Vol. 7, No. 3, P. 345**
Waterproofing agent, vaporized in bubbler transported by gas flowing in system and deposits in pores of tiles. Vapor carried through hole of approximately 1/16 inch (1.6.mm) diameter made in tile coating. Technique used to waterproof buildups (concrete and brick) and possibly fabrics.

B83-10112
GAS-JET MENISCUS CONTROL IN RIBBON GROWTH
J. A. ZOUTENDYK (CALTECH) and O. VONROOS (CALTECH)
Aug. 1983
NPO-14978 **Vol. 7, No. 3, P. 347**
Gas jet used to control shape of meniscus and thus to regulate ribbon thickness in vertical silicon-ribbon growth. Gas jet also cools ribbon, increasing maximum possible pull speed for silicon, contact angle of 11 degrees plus or minus 1 degree required for constant thickness ribbon growth. Cooling effect of gas jet increases maximum possible pull speed.

B83-10113
ATTITUDE CONTROL BY LOCALIZED OUTGASSING
D. D. ELLEMAN (CALTECH), T. G. WANG (CALTECH), and A. CROONQUIST (CALTECH)
Aug. 1983
NPO-15575 **Vol. 7, No. 3, P. 347**
Attitude control of levitated object achieved by using laser to vaporize selectively sublimate coating. Laser heats material that will sublime or outgas. To obtain torque reaction force vector from subliming material must not pass through center-of-mass of object. Laser provides beam suitable for controlling objects in noncontact manufacturing processes in acoustic levitation chambers.

B83-10114
MORE-UNIFORM HEAT CURING FOR STRUCTURAL REPAIRS
P. E. BAUER (McDonnell Douglas Corp.) and M. A. WALKER
Aug. 1983
MSC-20101 **Vol. 7, No. 3, P. 348**
Copper lining helps to distribute heat under heating blanket. Bond during setup employs heating blanket over copper sheet within vacuum bag. Copper sheet smoothes out temperature distribution under hotspots in heater. Method applicable to uniformly heating such low-thermal-conductivity metals as titanium or stainless steel.

B83-10115
FABRICATION OF GRAPHITE/EPOXY COLUMN ELEMENTS
R. M. BLUCK (Lockheed Missiles & Space Co., Inc.), G. H. GROTBECK (Lockheed Missiles & Space Co., Inc.), and W. M. REIGHARD (Lockheed Missiles & Space Co., Inc.)
Aug. 1983
LAR-12915 **Vol. 7, No. 3, P. 348**
Dimensionally precise columns wound on vertical mandrels. Dry fiber wound on tapered aluminum mandrel and outer sleeve. Winding and injection done at elevated temperature to minimize thermal-expansion problems during curing of resin. Technique used in textile industry.

B83-10116
LOW-WEIGHT INSERTS FOR ALUMINUM HONEYCOMB PANELS
G. S. BUMGARNER (Vought Corp.) and M. W. REED (Vought Corp.)
Aug. 1983
MSC-20227 **Vol. 7, No. 3, P. 349**
Fiber/epoxy composites used in place of solid aluminum. New proposal suggests to make inserts out of such lightweight, high strength materials as fiber/epoxy composites or high density aluminum honeycomb. Composite insert is same size and shape as aluminum insert it replaces.

B83-10117
ACOUSTICAL-LEVITATION CHAMBER FOR METALLURGY
M. B. BARMATZ (CALTECH), E. TRINH (CALTECH), T. G. WANG (CALTECH), D. D. ELLEMAN (CALTECH), and N. JACOBI (CALTECH)
Aug. 1983
NPO-15453 **Vol. 7, No. 3, P. 350**
Sample moved to different positions for heating and quenching. Acoustical levitation chamber selectively excited in fundamental and second-harmonic longitudinal modes to hold sample at one of three stable postions: A, B, or C. Levitated object quickly moved from one of these positions to another by changing modes. Object rapidly quenched at A or C after heating in furnace region at B.

B83-10118
ACOUSTIC LEVITATION WITH LESS EQUIPMENT
M. B. BARMATZ (CALTECH) and N. JACOBI (CALTECH)
Aug. 1983
NPO-15562 **Vol. 7, No. 3, P. 350**
Certain chamber shapes require fewer than three acoustic drivers. Levitation at center of spherical chamber attained using only one acoustic driver. Exitation of lowest spherical mode produces asymmetric acoustic potential well.

B83-10119
PULL TEST VERIFIES GAP LOADING
G. R. HAGEN (Rockwell International Corp.)
Aug. 1983
MSC-20231 **Vol. 7, No. 3, P. 352**
Thin plastic strip pulled away from gap by force gage

to measure pressure applied on gap filler. Force necessary to initiate movement of thin plastic strip is measure of gap tightness. Procedure determines interface pressures or loads where conventional load-measuring equipment cannot be used. Used to check refrigerator-door seals.

B83-10120
ANNEALING SOLAR CELLS WITH LASERS
J. S. KATZEFF (Lockheed Missiles & Space Co.) and M. LOPEZ
Aug. 1983
NPO-15694 **Vol. 7, No. 3, P. 352**

Laser anneals silicon solar cells rapidly enough for use in production. Laser frequently doubled neoduyminum: yttrium-aluminum-garnet (Nd:YAG) device. 30-m-diameter spot formed by lasers covers enough area to process silicon wafers rapidly. Laser annealed cells have efficiencies greater than 15 percent.

B83-10214
FABRICATING SLOTTED-WAVEGUIDE ARRAYS FROM SHEET METAL
W. C. BROWN (Raytheon Co.)
Oct. 1983
NPO-15664 **Vol. 7, No. 4, P. 457**

Low-cost lightweight waveguides formed from rolls of aluminum. Array formed from sheared, punched, and bent aluminum sheets. Sheets alined with punched jig holes and joined by laser-beam or resistance spot welding. Process permits use of thin metal to reduce raw material costs and mass. Also holds closer tolerances than usually attained in sheet-metal work.

B83-10215
FORMING MIRRORS ON COMPOSITE MATERIALS
R. E. GAULDIN (CALTECH) and K. RAMOHALLI (CALTECH)
Oct. 1983
NPO-15912 **Vol. 7, No. 4, P. 458**

Smooth coatings deposited on hard-to-polish substrates. Lightweight mirror, leaning against conventional glass mirror, consists of metallic relective layer on substrate coated with polyester resin. Smooth surface of polyester resin made by covering freshly applied resin with piece of smooth glass coated with release agent.

B83-10216
BETTER SEALS FOR VACUUM BAGS
B. PENN and J. M. CLEMONS
Oct. 1983
MFS-25875 **Vol. 7, No. 4, P. 459**

Roller tool spreads even layer of adhesive. Tool easily constructed from metal, plastic, or wood. Sewing-thread spool serves as roller, nail as axle, and jigsawed block of wood as handle. Tool rolled and pressed against plastic film to assure even layer of adhesive around periphery.

B83-10217
ABSORBABLE-SUSCEPTOR WELDING OF CERAMICS
J. E. SCHROEDER (Caltech) and P. J. SHLICHTA (Caltech)
Oct. 1983
NPO-15640 **Vol. 7, No. 4, P. 460**

Susceptor becomes part of joint. Susceptor is heated to high temperature by RF energy, then melts adjacent ceramic material. Susceptor dissolves in molten ceramic. When cooled, ceramic parts form moloithic assembly. Suitable for joining complex subassemblies in heat exchangers or other ceramic process equipment for high temperatures.

B83-10218
PREPARING SOLAR CELLS FOR SOLDERING
J. J. HAGERTY (MB Associates)
Oct. 1983
NPO-15626 **Vol. 7, No. 4, P. 461**

Solder paste and contact ribbon dispensed in synchronism. Solder-paste dispenser operates on one cell at a time. Ribbon fed up ramps and into positioned while solder paste is applied. When ramps are moved out of way, ribbon lies down onto cell.

B83-10219
REDUCING THE RESISTANCE OF CONDUCTIVE-ADHESIVE BONDS
L. J. GUERTIN (Rockwell International Corp.), K. L. BILLINGTON (Rockwell International Corp.), and V. R. WARD (Rockwell International Corp.)
Oct. 1983
MSC-20427 **Vol. 7, No. 4, P. 462**

Current pulses lower resistance of silver-filled epoxies. Capacitive discharge reduces interfacial resistance between aluminum surfaces joined with silver-filled epoxy. Technique offers noninvasive solution to problem of attaching grounding brackets to aluminum honeycomb structures.

B83-10220
LIGHT, SERVICEABLE INSULATION BLANKET
A. J. SWIRSLEY (Rockwell International Corp.)
Oct. 1983
MSC-20452 **Vol. 7, No. 4, P. 462**

Lightweight insulation blanket with aluminized, reinforced polyester facing resists crushing and weighs less than previous insulation blankets with textured stainless steel facing. New hook-and loop fasteners facilitate installation and removal. Useful in vehicle construction and other application in which low weight, easy removability for repairs, and long service life are important.

B83-10221
ELECTRODEPOSITION REPAIR OF DAMAGED METAL PARTS
M. KAUFMAN (Rockwell International Corp.) and J. RIETDYK
Oct. 1983
MFS-19783 **Vol. 7, No. 4, P. 463**

Damaged material replace by electrodeposited copper. Channel restoration consists of alternately machinging damaged material and reconstructing material by electrodeposition. Solid wax processed into coolant channels to provide plating surfaces that match original channel surfaces.

B83-10222
ELECTROLYTIC SHARPENING OF DIODE-CONTACT WHISKERS
G. GREEN (University of Virginia) and R. J. MATTAUCH (University of Virginia)
Oct. 1983
NPO-15789 **Vol. 7, No. 4, P. 464**

Phosphor bronze wire pointed without highly-toxic chemical reagents. Phosphor bronze wire to be pointed affixed to metal post held by fixture, such as pin vise. Fixture moved axially by micrometer allows precise control of position of end of wire with respect to surface of pointing solution. Solution consists of 4 weight percent sulfamic acid crystals in deionized water. Dissolution current adjusted via the autotransformer setting.

B83-10223
FABRICATION OF STRUCTURAL CELLULAR GLASS
W. D. MITCHELL (Solaramics, Inc.) and D. J. MAXWELL (Solaramics, Inc.)
Oct. 1983
NPO-15731 **Vol. 7, No. 4, P. 465**

Surface layer quickly heated and compressed. Postcellulation skin densification uses gas burners to head lower surface of material and pinch rollers to compress heated-surface layer. Useful for manufacturing large low cost, parabolic dish solar collectors.

B83-10224
POLYMER BONDING OF OPTICAL FIBERS
W. GOSS (Caltech) and M. D. NELSON (Caltech)
Oct. 1983

NPO-15464 **Vol. 7, No. 4, P. 466**

Optical waveguides coupled through their sides. In fiber etching process bonded length for coupling determined by observing optical output powers in two fibers. Surface tension of etchant remaining between two fibes holds then in contact when raised from solution for power measurement. When fibers reimmersed, they separate allowing free access by etchant.

B83-10225

X-RAY INSPECTION OF TRANSISTORS

W. P. HUBBARD (Caltech)

Oct. 1983

NPO-15675 **Vol. 7, No. 4, P. 466**

Component holder speeds examination of matched pairs. Transistors are oriented for two perpendicular x-ray views. Second view obtained by simply flipping block around corner near components, while corner remains in contact with film. Procedure allows inspection of up to 50 pairs - two views of each pair - on single x-ray film in same time previously required for 1 unmounted pair.

B83-10226

PRESSURE-REDUCTION TECHNIQUE FOR CRYSTAL GROWTH

P. J. SHLICHTA

Oct. 1981

NPO-15772 **Vol. 7, No. 4, P. 467**

Large crystals grown by varying pressure rather than temperature. In constant temerature pressure-reduction process crystal growth promoted as solubility decreases by factor of more than 10. Technique used to study crystal growth kinetics by 'pressure wave'' analog of conventional 'thermal wave' experiments. Technique has advantages of faster response and freedom from convective interference.

B83-10227

PHASE MODULATION VARIES AVERAGE ACOUSTIC TORQUE

D. D. ELLEMAN (Caltech), A. P. CROONQUIST (Caltech), and T. G. WANG (Caltech)

Oct. 1983

NPO-15689 **Vol. 7, No. 4, P. 468**

Rotation of acoustically levitated objects controlled. Phase difference alternated between +90 degrees and -90 degrees. If system is at positive phase difference during greater portion of modulation cycle than at negative phase difference (or vice versa), there is nonzero time-averaged acoustic torque.

B83-10228

ELECTROSTATIC LEVITATOR WITH FEEDBACK CONTROL

W. K. RHIM (Caltech), M. M. SAFFREN (Caltech), and D. D. ELLEMAN (Caltech)

Oct. 1983

NPO-15553 **Vol. 7, No. 4, P. 469**

Sample position automatically maintained. Object levitated by electrostatic field between two electrodes. Because of particular curved electrode shape, levitation field has stable horizontal position on vertical axis of symmetry. Vertical position of object sensed and compared with preset value. When position error is detected, amplitude of levitating field is increased or decreased to restore zero error. System offers options well to containerless processing.

B83-10229

GAS-BEARING CRUCIBLE FOR SHOT TOWER

C. L. YOUNGBERG (Caltech), C. G. MILLER (Caltech), J. B. STEPHENS (Caltech), and A. A. FINNERTY (Caltech)

Oct. 1983

NPO-15070 **Vol. 7, No. 4, P. 470**

Device protects molten drops from contamination and distortion. Gas flowing through levitator tube levitates small balls while they melt. Gas heated by filament extending through center of tube. Gas bearing crucible on tube has concave configuration to hold single relatively large ball or many recesses to hold many small balls. By time spheres reach foam, they are cooled sufficiently by radiation to retain their shape.

B83-10230

HOLLOW-SPHERE PRODUCTION LINE

M. C. LEE (Caltech)

Oct. 1983

NPO-15592 **Vol. 7, No. 4, P. 471**

After initial formation, spheroids processed without contaminating touch of solid objects. Spheroid in process supported by acoustic levitation at each work station and transported between stations by combination of acoustic levritation and acoustic propulsion. Automatic sequence of target-pellet fabication allows no contact of solid ojbect with spheroids in process. Potential for manufacture of precise microcapsules for catalysts and medications.

B83-10231

PRODUCING METALLIC GLASSES WITH ACOUSTIC LEVIATION

M. C. LEE (Caltech) and I. A. FENG (Caltech)

Oct. 1983

NPO-15658 **Vol. 7, No. 4, P. 472**

Acoustic fields support and cool liquid particles. Levitated by sound energy, liquid drop in acoustic standing-wave field surrounded by acousticically-induced jet streams. Streaming gas cools drow below its freezing point in small fraction of second. Allows new amorphous alloys including 'metallic glass' to be formed.

B83-10232

TEST PATTERN FOR IC'S

T. W. GRISWOLD (Caltech) and E. T. BATES JR. (Caltech)

Oct. 1983

NPO-15648 **Vol. 7, No. 4, P. 473**

Random-fault densities measured in array of standard structures. Test pattern is array of standard circuit elements built into circuit chip along with, or in lieu of, integrated circuit objective process. Measurements on ray made and interpreted so fabrication process can be corrected as necessary.

B83-10233

QUALITY-PLANNING-REQUIREMENTS DOCUMENTS

P. A. LEONARD (Rockwell International Corp.) and A. FLORES (Rockwell International Corp.)

Oct. 1983

MSC-20280 **Vol. 7, No. 4, P. 474**

Report outlines planning procedures used in establishing inspection and quality assurance activities required of contractors constructing and testing Space Shuttle and ground-support equipment. Report useful to contractors establishing inspection points in commercial manufacturing operations.

B83-10234

STUDIES OF THE INVERTED MENISCUS DEPOSITION OF SILICON ON CERAMIC

J. D. ZOOK (Honeywell, Inc.), B. GRUNG (Honeywell, Inc.), S. B. SCHULDT (Honeywell, Inc.), F. M. SCHMIT (Honeywell, Inc.), and J. D. HEAPS (Honeywell, Inc.)

Oct. 1983

NPO-15602 **Vol. 7, No. 4, P. 474**

Controlled temperature profiles essential to production of solar cells. Studies of inverted meniscus process for depositing silicon coatings on ceramic substrates described in new report. When fully developed, processed used to manufacture low-cost solar photovoltaic cells.

B83-10235

POLYMERIC APPLICATIONS IN ELECTRONICS

W. S. READ (Caltech)

Oct. 1983

NPO-16081 **Vol. 7, No. 4, P. 475**

Training manual shows how to use polymeric materials in fabrication electronic components. Report discusses polymeric applications in fabrication of electronic components and equipment. Intended as training manual for 6-day quality assurance and technician certification course in use of polymeric materials.

B83-10236
LOW-COST ALTERNATIVES IN HYBRID MICROCIRCUIT PACKAGING
S. V. CARUSO (Rockwell International Corp.), V. L. CHAMPION (Rockwell International Corp.), R. N. BASSETT (Rockwell International Corp.), and J. N. GAYER (Rockwell International Corp.)
Oct. 1983
MFS-25809 **Vol. 7, No. 4, P. 475**

Adhesive sealing, nickel plating, and multiwire boards evaluated. Based on study involving fully developed hardware, report considers adhesive packaging instead of seam welding, nickel-plated Kovar (commercial Fe/NI/Co alloy) packages instead of gold plates ones, and multiwire circuit boards instead of multilayer boards as alternatives for reducing cost of hardware without reducing reliability.

B83-10237
THERMAL MODELING OF BRIDGMAN CRYSTAL GROWTH
E. COTHRAN
Oct. 1983
MFS-27003 **Vol. 7, No. 4, P. 475**

Heat Flow modeled for moving or stationary rod shaped sample inside directional-solidification furnace. Program effectively models one-dimensional heat flow in translating of motionless rod-shaped sample inside of directional-solidification furnace in which adiabatic zone separates hot zone and cold zone. Applicable to systems for which Biot numbers in hot and cold zones are less than unity.

B83-10448
LIGHTWEIGHT METAL MIRRORS
E. GOSSETT (Hughes Aircraft Co.) and P. WINSLOW (Hughes Aircraft Co.)
Apr. 1984
GSC-12743 **Vol. 8, No. 1, P. 121**

Two 'eggcrate' halves brazed together. Lightweight flat mirrors fabricated by machining pockets in two plates of beryllium and brazing machined halves together. Mirror less than half weight of same mirror made by previous design.

B83-10449
FOIL PANEL MIRRORS FOR NONIMAGING APPLICATIONS
D. J. KUYPER (Hughes Aircraft Co.)02(Hughes Aircraft Co.) and A. A. CASTILLO
Apr. 1984
GSC-12751 **Vol. 8, No. 1, P. 122**

Large durable, lightweight mirrors made by bonding thick aluminum foil to honeycomb panels or other rigid, flat backings. Mirrors suitable for use as infrared shields, telescope doors, solar-furnance doors, advertising displays, or other reflectors that require low thermal emissivity and high specularity but do not require precise surface figure necessary for imaging.

B83-10450
HANDLING FIXTURE FOR SOLAR-CELL ARRAYS
P. A. DILLARD (Lockheed Missiles & Space Co., Inc.) and D. W. HIGBEE (Lockheed Missiles & Space Co., Inc.)
Apr. 1984
NPO-15908 **Vol. 8, No. 1, P. 123**

Thin cells processed and stored safely. Major parts of handling fixture hold components of solar cell array modules safely, yet allow assembly process to proceed without interference. Fixture used with or without internal vacuum. Concept allows handling of thin, relatively-fragile cells, and offers potential for savings in silicon material and cost.

B83-10451
BETTER THERMAL INSULATION IN SOLAR-ARRAY LAMINATORS
D. R. BURGER (Caltech) and J. F. KNOX (Caltech)
Apr. 1984
NPO-15925 **Vol. 8, No. 1, P. 124**

Glass marbles improve temperature control. Modified vacuum laminator for photovoltaic solar arrays includes thermal insulation made of conventional glass marbles. Marbles serve as insulation for temperature control of lamination process at cure temperatures as high as 350 degrees F. Used to replace original insulation made of asbestos cement.

B83-10452
EDGE SUPPORTS FOR PHOTOVOLTAIC MODULES
T. J. MALONEY (AIA Research Corp.)
Apr. 1984
NPO-15740 **Vol. 8, No. 1, P. 125**

Mounting strips patterned after glazing gaskets. Easy to install supports for rooftop solar modules consist of extruded rubber mullions with locking zippers. Supports cut to length with utility knife and installed without special tools. Adaptable to many different roof configurations.

B83-10453
PHOTOVOLTAIC ROOFS
R. W. DRUMMOND JR. (General Electric Co.) and N. F. SHEPARD JR. (General Electric Co.)
Apr. 1984
NPO-15881 **Vol. 8, No. 1, P. 126**

Solar cells perform two functions: waterproofing roof and generating electricity. Sections through horizontal and slanting joints show overlapping modules sealed by L-section rubber strips and side-by-side modules sealed by P-section strips. Water seeping through seals of slanting joints drains along channels. Rooftop photovoltaic array used watertight south facing roof, replacing shingles, tar, and gravel. Concept reduces cost of residential solar-cell array.

B83-10454
LABELING SOLAR-CELL MODULES
E. G. WATSON (RCA Corp.) and P. J. COYLE (RCA Corp.)
Apr. 1984
NPO-15997 **Vol. 8, No. 1, P. 127**

Photocopying machine produces durable identification label. Process used for double glass photovoltaic-cell modules. Matrix of cells sandwiched between thin, flexible glass mats and covered above and below by protective sheets of glass. Label contains such information as manufacturer, model number, voltage and power ratings, and serial number. May also contain electrical-shock hazard warning and identification of positive and negative terminals. Method saves expense of procuring and applying conventional labels.

B83-10455
OSCILLATING-CRUCIBLE TECHNIQUE FOR SILICON GROWTH
T. DAUD (Caltech), K. A. DUMAS (Caltech), K. M. KIM (IBM Corp.), G. H. SCHWUTTKE (IBM Corp.), and P. SMETANA (IBM Corp.)
Apr. 1984
NPO-15938 **Vol. 8, No. 1, P. 127**

Technique yields better mixing of impurities and superior qualiity crystals. Accellerated motion stirs melt which reduces temperature gradients and decreases boundary layer for diffusion of impurities near growing surface. Results better mixing of impurities into melt, decrease in tendency for dendritic growth or cellular growth and crystals with low dislocation density. Applied with success to solution growth and Czochralski growth, resulting in large crystals of superior quality.

B83-10456
IMPROVED RADIATIVE CONTROL OF RIBBON GROWTH
J. P. MCHUGH (Westinghouse Electric Corp.), R. G. SEIDENSTICKER (Westinghouse Electric Corp.), and M. E. SKUTCH (Westinghouse Electric Corp.)
Apr. 1984
NPO-15916; NPO-15917; NPO-15918 Vol. 8, No. 1, P. 128

Shield modifications enhance growth rate while reducing silicon oxide formation. Control of dendritic-web crystal growth requires precise control of web temperature profile. Achieved by using series of thermal radiation shields to control thermal-radiation field in region where melt solidifying onto crystal ribbon being pulled from melt.

B83-10457
COLD-CRUCIBLE PREMELTER FOR SILICON
R. L. LANE (Kayex Corp.)
Apr. 1984
NPO-16050 Vol. 8, No. 1, P. 130

System allows replenishment of silicon melt in crystal puller. Cold crucible consists of water-cooled, silver plated boat in 500kHz field. Induced secondary currents cause preheated chunks of silicon to melt. Magnetic repulsion between current in silicon and in boat prevents silicon from touching boat. Used for crystal growth of other materials sufficiently conductive and difficult to keep free of contamination by container walls at temperature of operation.

B83-10458
STARTING SILICON-RIBBON GROWTH AUTOMATICALLY
J. P. MCHUGH (Westinghouse Electric Corp.)
Apr. 1984
NPO-15919 Vol. 8, No. 1, P. 130

Semiautomatic system starts growth of silicon sheets more reliably than system with purely manual control. Control signals for starting sheetcrystal growth consist of ramps (during which signal changes linearly from one value to another over preset time interval) and soaks (during which signal remains constant). Ramps and soaks for best temperature and pulling speed determined by experimentation.

B83-10459
GROWING SINGLE-CRYSTAL SHEETS BY CONTROLLED COOLING
A. D. MORRISON (Caltech)
Apr. 1984
NPO-15800; NPO-15827 Vol. 8, No. 1, P. 131

Immersed heating and cooling elements establish desired temperature gradients. Method envisions use of high-pressure, Czochralski crystalgrowth apparatus as presently employed to grow gallium arsenide and gallium phosphide but modified to accept deep crucibles so deep layers of encapsulant used, plus X-ray or optical or sonic-imaging system to observe growth of crystal submerged in encapsulant. Method especially applicable to horizontal growth of ribbons of compound semiconductors.

B83-10460
INTERSTITIAL COLLIMATING HOLES FOR GAS-LEVITATION MICROFURNACE
E. G. DUNN (Bjorksten Research Laboratories, Inc.), E. G. PAQUETTE (Bjorksten Research Laboratories, Inc.), E. C. ETHRIDGE (Bjorksten Research Laboratories), and J. L. JOHNSON (Bjorksten Research Laboratories, Inc.)
Apr. 1984
MFS-25829 Vol. 8, No. 1, P. 132

Spaces between small rods direct gas flow. Wires for thin rods clamped in square array in precise square gooove. Spaces between wires are long, thin, parallel channels that direct flow of gas. Technique extended to such hard-to-machine refractory metals as tungsten and molybdenum.

B83-10461
OFF-RESONANCE ACOUSTIC LEVITATION WITHOUT ROTATION
M. B. BARMATZ (Caltech) and J. L. ALLEN (Caltech)
Apr. 1984
NPO-15634 Vol. 8, No. 1, P. 133

Orthogonal acoustic-levitation modes excited at slightly different frequencies to control rotation. Rotation of object in square cross-section acoustic-levitation chamber stopped by detuning two orthogonal (x and y) excitation drivers in plane of square cross section. Detuning done using fundamental degenerate modes or odd harmonic modes.

B83-10462
SONIC-PUMP LEVITATOR
S. A. DUNN (Bjorksten Research Laboratories, Inc.), A. R. POMPLUN (Bjorksten Research Laboratories, Inc.), E. C. ETHRIDGE (Bjorksten Research Laboratories, Inc.), and J. L. JOHNSON (Bjorksten Research Laboratories, Inc.)
Apr. 1984
MFS-25828 Vol. 8, No. 1, P. 134

Audiospeaker drives gas and rapidly responds to corrective signals. Audiospeaker drives gas through plate opening and columnar outlets to levitate sphere. Exhaust flow dominated by gas momentum and essentially parallel to axis of outlets. With appropriate scaling up of hardware, sonic pump can function as levitator for containerless processing of more massive specimens of higher densities and of different materials.

B83-10463
IN SITU COMPOSITE FASTENER
W. T. FREEMAN JR., W. S. JONES, and G. L. FARLEY (U.S. Army Aviation Research and Development Command)
Apr. 1984
LAR-12939 Vol. 8, No. 1, P. 135

Fasteners installed prior to curing. In situ composite fastener polymeric, graphite, glass, or metallic thread, pin, or staple. Selected fastener pressed through thickness of composite component while composite is in prepreg or B-stage state. Parts not removed from mold to install fastener. Technique used around cutouts to prevent free edges from delaminating.

B83-10464
REPAIRING DAMAGED POWER-CABLE INSULATION
G. E. BAKER (Boeing Services International)
Apr. 1984
KSC-11206 Vol. 8, No. 1, P. 136

Simple method saves time, money, and material. In new method cable remains in place while new insulation is applied to damaged portion. Method results in new terminations with safety factor equal to that of any portion of cable.

B83-10465
GROWING CRYSTALS FOR INFRARED DETECTORS
S. L. LEHOCZKY (McDonnell Douglas Corp.) and F. R. SZOFRAN (McDonnell Douglas Corp.)
Apr. 1984
MFS-25786 Vol. 8, No. 1, P. 136

Unidirectional solidification yields bulk crystals with compositional homogeneity. Unidirectionaly crystal-growth furnace assembly travels vertically so crystal grows upward from bottom tapered end of ampoule. Separately controlled furnaces used for hot (upper) and cold (lower) zones. New process produces ingots with radial compositional homogeneity suitable for fabricating infrared detectors.

B83-10466
LIQUID-OXYGEN-COMPATIBLE CEMENT FOR GASKETS
N. L. ELMORE (Rockwell International Corp.) and B. C. NEALE (Rockwell International Corp.)
Apr. 1984
MFS-19797 Vol. 8, No. 1, P. 138

Fluorelastomer and metal bonded reliably by new procedure. To cure fluoroelastomer cement, metal plate/gasket assembly placed in vacuum bag evacuated to

minimum vacuum of 27 inches (69 cm) of mercury. Vacuum maintained throughout heating process and until assembly returns to ambient room temperature. Used to seal gaskets and O-rings or used to splice layers of elastomer to form non-standard sized O-rings. Another possible use is to apply protective, liquid-oxygen-compatible coating to metal parts.

B83-10467
FABRICATION OF HOLLOW SPHERES
J. M. KENDALL JR. (Caltech)
Apr. 1984
NPO-15798 **Vol. 8, No. 1, P. 138**
Nozzle forms gas-filled spherical shells of high dimensional uniformity. Hollow-Sphere shell generator produces gas-filled metal sphere at rate of about 100 per second with repeat ability in all dimensions. Sphere filled with gas at pressure as high as 2,000psi. Process well suited for making targets for laser fusion.

B83-10468
INTERFACE INSTABILITY DURING CRYSTAL GROWTH
W. A. TILLER (Stanford University), R. S. FEIGELSON (Stanford University), and D. ELWELL (Stanford University)
Apr. 1984
MFS-25841 **Vol. 8, No. 1, P. 139**
Report on study of solute segregation and interface stability during crystal growth describes new theoretical model for crystal growth from melt. Report also describes experiments in crystal growth by controlled-gradient freezing and by pulling from melt (Czochralski growth).

B83-10469
ERECTABLE SPACE-CONSTRUCTION FIXTURE
R. R. THOMPSON (Rockwell International Corp.)
Apr. 1984
MSC-20259 **Vol. 8, No. 1, P. 140**
Concept for erectable space construction fixture described in report. Fixture combines all equipment required for construction of framework for space platform into single compact work station. Almost all aspects of assembly and fabrication automated. Design goals for fixture include platform assembly in shortest possible time and minimizing fuel and power requirements of support spacecraft.

B83-10470
RAPID CIRCUIT BREADBOARDING
E. C. ETHRIDGE
Apr. 1984
MFS-25761 **Vol. 8, No. 1, P. 140**
Cost of one-of-a-kind circuit board reduced. Circuits assembled quickly by using prototyping board in conjunction with copper-clad circuit board that has same hole pattern.

B83-10471
IMPROVED SILICON-GROWTH CHAMBER
J. D. HEAPS (Honeywell, Inc.) and J. D. ZOOK (Honeywell, Inc.)
Apr. 1984
NPO-15237 **Vol. 8, No. 1, P. 141**
Silicon-growth technique, based on coating ceramic substrates with thin layer of molten silicon solidifies to form polycrystalline film, modified to produce solar-cell quality silicon sheet.

B83-10472
GROWING SINGLE CRYSTALS FROM LOW-PURITY SILICON
F. SCHMID (Crystal Systems, Inc.)
Apr. 1984
NPO-15538 **Vol. 8, No. 1, P. 141**
Heat exchanger method continuously moves impurities to outside of growth interface. Silicon heated in crucible to above melting point, and melted silicon then solidified by extracting heat from bottom of crucible by means of heat exchanger.

B83-10473
MELT-LEVEL SENSING IN SILICON-WEB GROOWTH
C. S. DUNCAN (Westinghouse Electric Corp.), M. E. SKUTCH (Westinghouse Electric Corp.), and K. B. STEINBRUEGGE (Westinghouse Electric Corp.)
Apr. 1984
NPO-15356 **Vol. 8, No. 1, P. 141**
Laser beam reflected from silicon-melt surface onto position detector to monitor melt level during web growth. Silicon web production increased by synchronizing silicon melt replenishment with web growth rate.

B83-10474
PROPOSED TECHNIQUE OF CRYSTAL-RIBBON GROWTH
J. W. THORNHILL (Caltech)
Apr. 1984
NPO-15629 **Vol. 8, No. 1, P. 141**
Technique for silicon crystal-ribbon growth from crucible, two inert wettable filaments dipped into silicon melt to guide growth of silicon sheet. Filaments clamped in place and tilted slightly away from each other and seed ribbon lowered into contact with melt to establish menisci between filaments.

B83-10475
SHIELD BOOSTS SILICON-GROWTH RATE
R. L. LANE (Kayex Corp.)
Apr. 1984
NPO-16049 **Vol. 8, No. 1, P. 141**
Radiation shield permits faster growth--by 20 percent--of singlecrystal silicon from molten silicon by producting sharper thermal gradients near growth front.

B83-10476
LOW-COST GAAS SOLAR CELLS
R. J. STIRN (Caltech) and J. SCOTT-MONCK (Caltech)
Apr. 1984
NPO-14914; NPO-14931 **Vol. 8, No. 1, PP. 141**
Single-crystal gallium arsenide (GaAs) solar cell produced at greatly reduced cost by replacing GaAs wafer substrate with silicon substrate.

B83-10477
PREVENTING MOISTURE DAMAGE TO SOLAR PANELS
E. G. LAUE (Caltech)
Apr. 1984
NPO-15481 **Vol. 8, No. 1, P. 142**
Encapsulating photovoltaic solar cells with polysulfonated membrane prevents molsture damage to cells. Gases escape through vents before damage can occur.

B83-10478
QUENCHING ALLOYS IN CONTAINERLESS PROCESSING
W. A. ORAN
Apr. 1984
MFS-25305 **Vol. 8, No. 1, P. 142**
Magnetic levitation and gas quenching combined in proposed method to melt and rapidly solidify alloys without contacting container walls. Method used to develop new carbides for drill bits, high-ductility structured steel and new high-strength superplastic alloys.

B83-10479
CONTAINERLESS-PROCESSING MODULE
T. G. WANG (Caltech), M. B. BARMATZ (Caltech), F. R. CHAMBERLAIN (Caltech), M. HAGAN (Caltech), R. C. HEYSER (Caltech), H. H. HORIUCHI (Caltech), J. H. KURASHITA (Caltech), J. K. LAMGMAIER (Caltech), R. L. ROBINSON (Caltech), R. P. SALAZAR (Caltech) et al
Apr. 1984
NPO-14932 **Vol. 8, No. 1, P. 142**
High-temperature, containerless-processing module positions and melts molten glass or metal without contact with container wall. Fluid masses manipulated, stirred, and

controlled by acoustic forces. Module provides photographic monitoring and transfer of solidified specimens to storage bins.

B83-10480
VALUE-ENGINEERING REVIEW FOR NUMERICAL CONTROL
J. L. WARNER (Rockwell International Corp.)
Apr. 1984
MFS-19664 **Vol. 8, No. 1, P. 142**
Selecting parts for conversion from conventional machining to numerical control, value-engineering review performed for every part to identify potential changes to part design that result in increased production efficiency.

B83-10481
CHECKING WELD COMPOSITION
M. D. ROBERTSON (Rockwell International Corp.) and S. M. COLLIER (Rockwell International Corp.)
Apr. 1984
MFS-19628 **Vol. 8, No. 1, P. 143**
Electrolytic etching determines whether certain iron/nickel alloys welded with sufficient quantities of desired filler metal.

B83-10482
ADHESIVE REMOVAL FROM PROTECTIVE CLOTHING
D. R. PRATHER (The Bendix Corp.)
Apr. 1984
KSC-11017 **Vol. 8, No. 1, P. 143**
Electrical eraser removes butyl cement from protective coveralls. Method used to remove other adhesives from different surfaces.

B83-10483
PORTABLE PLATING SYSTEM
R. FLORES (Rockwell International Corp.)
Apr. 1984
MFS-19631 **Vol. 8, No. 1, P. 143**
Plating system mounted on portable cart includes 30-gallon (23.5 liter) electrolyte tank, filler pump, heaters, replenishing anodes, plating rectifiers and tank rectifier to continously remove contaminants.

B83-10484
REPAIRING DEFECTIVE WELDS
T. ADAMS (Rockwell International Corp.)
Apr. 1984
MFS-19618 **Vol. 8, No. 1, P. 143**
Welds not reworked because limited accessibility or material-annealing considerations reinforced by electrodeposition. Procedure of interest for nuclear reactor construction.

B83-10485
WICKING COATING FOR HEAT PIPES
W. K. MINNICH (General Electric Co.)
Apr. 1984
NPO-15212 **Voll. 8, No. 1, P. 143**
Wicking for inside of heat pipes and heat-storage canisters formed by flame-spraying porous coating over wire mech placed on surface to be treated. Method less expensive than method currently used.

B83-10486
DECOUPLING A REFLECTING LAYER FROM ITS SUPPORT STRUCTURE
R. M. BAMFORD (Caltech)
Apr. 1984
NPO-15346 **Vol. 8, No. 1, P. 143**
Mounting decouples thermal distortions of reflective surface so not transmitted to support structure. Reflecting layer consists of aluminum reflecting tiles attached to support structure by flexural mounting bend and twist to accommodate thermal expansion of tiles. Technique useful in microwave-antenna reflectors.

B83-10487
SEALANT APPLICATOR FOR FASTENER HEADS
M. H. SHARPE, C. H. JACKSON, J. D. LAMBERT, C. HENDERSON, and W. E. NORTON
Apr. 1984
MFS-25922 **Vol. 8, No. 1, P. 144**
Dispenses sealant, either manually or automatically, in predetermined amounts. Applicator encapsulates heads of fasteners with measured shot of sealant to protect from corrosive environments.

B83-10688
BONDED LOCKSTITCH FOR INSULATING BLANKETS
J. M. RIVIN (Rockwell International Corp.), C. A. MORANT (Rockwell International Corp.), and R. M. EHRET (Rockwell International Corp.)
Nov. 1984
MSC-20283 **Vol. 8, No. 2, P. 271**
Improved sewing technique for high-temperature insulating blankets prevents stitch failure in hot, turbulent environments. Standard lockstitch modified to isolate single-stitch failures. Bobbin thread kept at blanket surface. Silicone adhesive applied to all bobbin/needle intersections, so failure at one point will not propagate along thread. Suitable for use in aerodynamic and other applications where there is turbulence.

B83-10689
REPAIRING HIDDEN CRACKS IN COOLANT TUBES
R. MILLS SR. (Rockwell International Corp.) and J. DUESBERG (Rockwell International Corp.)
Nov. 1984
MFS-19796 **Vol. 8, No. 2, P. 272**
Repair technique closes leaks in tubes or conduits where access limited to wall opposite crack. Technique applicable to any tubular assembly where tubes bundled together or bonded to supporting shell, such as in heat exchangers. Procedure provides structural support to area failed and uninterrupted flow without significantly altering heat-transfer profile.

B83-10690
AUTOMATIC GUIDANCE SYSTEM FOR WELDING TORCHES
H. SMITH, W. WALL, and M. BURNS JR.
Nov. 1984
MFS-25807 **Vol. 8, No. 2, P. 273**
Digital system automatically guides welding torch to produce squarebutt, V-groove and lap-joint weldments within tracking accuracy of +0.2 millimeter. Television camera observes and traverses weld joint, carrying welding torch behind. Image of joint digitized, and resulting data used to derive control signals that enable torch to track joint.

B83-10691
FITTING FLEXIBLE COVERINGS TO CONTOURED SURFACES
D. D. HELMAN (Rockwell International Corp.), S. Y. YOSHINO (Rockwell International Corp.), and D. S. WANG (Rockwell International Corp.)
Nov. 1984
MSC-20503 **Vol. 8, No. 2, P. 274**
Method using two transparent plastic sheets and polyethylene foam spacer produces flat templates from contoured surfaces. Once prepared, templates laid flat, and insulation inserted between two templates cut to shape to fit contoured surface. Sections of insulation prepared by contour-transferring technique fit contoured surfaces precisely. Procedure used for tailoring protective covers or for installation of vibrationabsorbing material over contoured surfaces.

B83-10692
IC FABRICATION METHODS IMPROVE LASER DIODES
M. MILLER (Perkin-Elmer Corp.) and V. PICKHARDT (Perkin-Elmer Corp.)

Nov. 1984 See Also NASA CR-165683
LAR-13059 **Vol. 8, No. 2, P. 275**
Family of high-performance, tunable diode lasers developed for use as local oscillators in passive laser heterodyne spectrometer. Diodes fabricated using standard IC processes include photolithography, selective etching and vacuum deposition of metals and insulators. Packaging refinements improved thermal-cycling characteristics of diodes and increased room-temperature shelf life.

B83-10693
ICE AS AN ABRADING AGENT
R. K. BLOW (Rockwell International Corp.)
Nov. 1984
MFS-19837 **Vol. 8, No. 2, P. 276**
Grit-blasting method makes unnecessary to disassemble equipment for cleaning. Stream of small, frozen pellets directed at assembly to be cleaned. Pellets consist of deionized-water ice, carbon dioxide ice, or another substance that does not react chemically with parts to be cleaned and leaves no residue. Method suited to cleaning titanium and parts that touch liquid oxygen.

B83-10694
FORMING LIGHTWEIGHT BEAMS FROM COMPOSITE TAPE
Innovator Not Given (Goldsworthy Engineering, Inc.) Nov. 1984
MFS-25880 **Vol. 8, No. 2, P. 277**
Hollow beams for assembling trusses and other structures produced from graphite/polysulfone tape. Process results in structures strong, light, and durable. Used to mass produce other lightweight parts besides beams.

B83-10695
POLYURETHANE FILLER FOR ELECTROPLATING
J. L. BEASLEY (Rockwell International Corp.)
Nov. 1984
MFS-19851 **Vol. 8, No. 2, P. 277**
Polyurethane foam proves suitable as filler for slots in parts electroplated with copper or nickel. Polyurethane causes less contamination of plating bath and of cleaning and filtering tanks than wax fillers used previously. Direct cost of maintenance and indirect cost of reduced operating time during tank cleaning also reduced.

B83-10696
RIBBED COOLANT LINERS FOR COMBUSTION CHAMBERS
W. R. WAGNER (Rockwell International Corp.)
Nov. 1984
MFS-19829 **Vol. 8, No. 2, P. 278**
Coolant-carrying liner for combustion chambers runs cooler and tolerates high-temperature excursions without burning out. Hot gases flowing through core prevented by liner from damaging shell. Concept applicable to such high-temperature chambers as rocket pre-burners, turbojet cans, stationary-turbine combustors, oil burners, and high-pressure chemical reactors.

B83-10697
LOCKING CORNERS SPEED SOLAR-ARRAY FRAME ASSEMBLY
S. OLAH (Applied Solar Energy Corp.) and W. J. SAMPSON (Applied Solar Energy Corp.)
Nov. 1984
NPO-15750 **Vol. 8, No. 2, P. 279**
Mitered corners of solar-array frames joined together by single angle brace and two springs. Locking corner braces and mating frame members pushed together by hand or assembled automatically. Fastening system used to assemble window screens and picture frames.

B83-10698
RIBBON REDUCES SPIKING IN ELECTRON-BEAM WELDING
R. E. OLSON (Rockwell International Corp.)
Nov. 1984
MFS-19701 **Vol. 8, No. 2, P. 279**
Spiking in electron-beam welding reduced by placing high-vaporpressure substance along path of electron beam. Strip of metal having vapor pressure higher than base metal at same temperature placed in slot machined along weld line. Strip vaporizes as beam strikes it, and vapor pressure keeps surface tension from closing off top of channel. Technique used successfully on nickel alloys and aluminum alloys and effective on steel and titanium.

B83-10699
LESS-COSTLY ION IMPLANTATION OF SOLAR CELLS
D. J. FITZGERALD (CALTECH)
Dec. 1984
NPO-15511 **Vol. 8, No. 2, P. 280**
Experiments point way toward more relaxed controls over ion-implanation dosage and uniformity in solar-cell fabrication. Data indicate cell performance, measured by output current density at fixed voltage, virtually same whether implant is particular ion species or broad-beam mixture of several species.

B83-10700
JOINING TUBES WITH ADHESIVE
W. A. BATEMAN (Rockwell International Corp.)
Dec. 1984
MFS-25958 **Vol. 8, No. 2, P. 281**
Cylindrical tubes joined together, end to end, by method employing adhesive, tapered ends, and spacing wires. Tapered joint between tubular structural elements provides pressure between bonding surfaces during adhesive curing. Spacing wires prevent adhesive from being scraped away when one element inserted in other. Method developed for assembling structural elements made of composite materials.

B83-10701
POSITIONING VISE FOR CRYSTAL CLEAVAGE
F. C. HALLBERG and C. J. MORGAN
Dec. 1984
GSC-12762 **Vol. 8, No. 2, P. 282**
Vise manipulates brittle crystals, such as lithium fluoride, so they are in proper position for cleaving. Vise allows crystals as thin as 2 millimeters or less positioned so that cleaved without breakage. Vise holds workpiece firmly but gently. Bushings, shafts and adjusting screw designed to move jaws smoothly and uniformly with great tactile sensitivity.

B83-10702
ULTRASONIC BONDING OF SOLAR-CELL LEADS
W. FRASCH (Kulicke and Soffa Industries, Inc.)
Dec. 1984
NPO-16140 **Vol. 8, No. 2, P. 283**
Rolling ultrasonic spot-bonding method successfully joins aluminum interconnect fingers to silicon solar cells with copper metalization. Technique combines best features of ultrasonic rotary seam welding and ultrasonic spot bonding: allows fast bond cycles and high indexing speeds without use of solder or flux. Achieves reliable bonds at production rates without damage to solar cells. Bonding system of interest for all solar-cell assemblies and other assemblies using flat leads (rather than round wires).

B83-10703
REPAIRABLE ENCAPSULATED ELECTRONIC MODULES
P. C. DOZOIS (CALTECH) and R. C. MAYNE (CALTECH)
Dec. 1984
NPO-15079 **Vol. 8, No. 2, P. 284**
Packaging technique seals electronic modules as effectively as potting in epoxy, yet permits removal of encapsulant when component change necessary. Technique encloses module in thin, rigid epoxy/fiberglass shell containing lightweight syntactic foam.

B83-10704
FABRICATION OF MULTI-PLY BIREFRINGENT FIBROUS COMPOSITE LAMINATES
I. DANIEL (ITT Research Institute) and T. NIIRO (ITT Research Institute)
Dec. 1984 See Also NASA CR-165709
LAR-12960 **Vol. 8, No. 2, P. 284**
Fabrication method produces unidirectional, multi-ply, transparent birefringent fibrous composite laminates for use in macromechanical stress analysis conducted by means of anisotropic photoelasticity. New laminates glass-fiber-reinforced plastics for which matrix and fibers have same index of refraction. Method utilized in structural applications of composites.

B83-10705
MODIFIED FABRICATION FOR INGAASP STRIP LASER
I. LADANY (RCA Corp.) and T. R. FURMAN (RCA Corp.)
Dec. 1984
LAR-12986 **Vol. 8, No. 2, P. 285**
Improved fabrication of InGaAsP stripe lasers involves replacement of oxide stripe in quaternary laser by an n-type layer of InP grown on top of quaternary cap layer. Process allows use of stop etch that selectively removes InP and does not etch InGaAsP, making fabrication especially convenient.

B83-10706
FRAME ALLINES FIBERS IN MULTILAYER COMPOSITES
J. CLEMONS, F. LEDBETTER III, B. PENN, W. WHITE, and J. DANIELS
Dec. 1984
MFS-25959 **Vol. 8, No. 2, P. 286**
Jib ensures layers of fiber-reinforced preimpregnated tape correctly oriented in assembly of composite panels. Jig enables fast and reproductible alinement of fibers in multiaxis layups.

B83-10707
PHASE MODULATION STOPS LEVITATED SAMPLE ROTATION
M. B. BARMATZ (CALTECH) and J. H. BROWN (CALTECH)
Dec. 1984
NPO-16002 **Vol. 8, No. 2, P. 286**
Rotation of sample in acoustic levitator prevented by relatively simple phase-modulation scheme. Technique differs from older methods; no feedback control or observation of sample required, nor necessary to carefully tune or detune two oscillators to precise frequency differences from resonance.

B83-10708
PROCESSES FOR VLSI CIRCUITS
T. E. WADE (Mississippi State University)
Dec. 1984
MFS-25857 **Vol. 8, No. 2, P. 287**
Four-volume document reviews key technologies for interconnecting in very-large-scale integrated (VLSI) circuits. Document also discusses current and proposed research into novel fabrication techniques for interconnections.

B83-10709
OPTIMIZING GRID PATTERNS ON PHOTOVOLTAIC CELLS
D. R. BURGER (CALTECH)
Dec. 1984
NPO-15841 **Vol. 8, No. 2, P. 288**
CELCAL computer program helps in optimizing grid patterns for different photovoltaic cell geometries and metalization processes. Five different powerloss phenomena associated with front-surface metal grid pattern on photovoltaic cells.

B83-10710
OXIDATION PROTECTION FOR THERMOCOUPLES
R. RICHTER (CALTECH)
Dec. 1984
NPO-15605 **Vol. 8, No. 2, P. 288**
Thin platinum film on thermocouple sheath protects non-noble-metal thermocouples from deterioration in oxygen-rich atmosphere. Coating works on nickel-alloy sheathed thermocouples otherwise destroyed by corrosion in pure oxygen at 1,000 degrees C.

B83-10711
TOROIDAL ELLIPSOID FLOAT-ZONE HEATER
R. B. DAVIDSON (Technology Development Corp.)
Dec. 1984
MFS-25771 **Vol. 8, No. 2, P. 288**
Furnace heats and melts circumferential ring of material ('Float Zone') on round bar. In float-zone processing, bar pulled through furnace so zone travels along bar.

B83-10712
REPAIRING THERMAL TILES
C. R. MCCAIN JR. (Rockwell International Corp.) and C. W. FEILER (Rockwell International Corp.)
Dec. 1984
MSC-20336 **Vol. 8, No. 2, P. 288**
Small chips and depression in surfaces of surface insulation tiles repaired using Ludox colloidal silica solution and silica powder. No waiting time necessary between mixing filler and using it. Patch cures quickly without heat being applied.

B83-10713
BELLOWS WITH LONGITUDINAL BEAMS
W. GARVIN (Rockwell International Corp.)
Dec. 1984
MFS-19633 **Vol. 8, No. 2, P. 289**
Bellows assembled using two longitudinal side seams allow seam joints to be placed in axial directions of bellows. Design of particular importance in difficult situations where frequent assembly or repair required or in limited-access areas not desirable to disassemble total unit to replace one-piece bellows.

B83-10714
STRAIN ANALYSIS OF GRAPHITE/EPOXY VESSELS
V. VERDERAIME and M. RHEINFURTH
Dec. 1984
MFS-27018 **Vol. 8, No. 2, P. 289**
NASA Technical Paper discusses stiffness parameters of filament-wound graphite/epoxy pressure vessels. In some situations, lightweight composite substituted for steel.

B83-10715
ELECTROFORMED ELECTRODES FOR ELECTRICAL-DISCHARGE MACHINING
A. WERNER (Rockwell International Corp.) and M. CASSIDENTI (Rockwell International Corp.)
Dec. 1984
MFS-19651 **Vol. 8, No. 2, P. 289**
Copper electrodes replace graphite electrodes in many instances of electrical-discharge machining (EDM) of complex shapes. Copper electrodes wear longer and cause less contamination of EDM dielectric fluid than do graphite electrodes.

B83-10716
SECURING IDENTIFICATION SLEEVING
E. P. SEIGGUM (Rockwell International Corp.)
Dec. 1984
MFS-19685 **Vol. 8, No. 2, P. 289**
Identification sleeving slides or bunches during handling or vibration held in place by shrinkage tubing. Tubing slid over one end of cable and shrunk with hand-held hot-air gun.

B83-10717
CRYOGENIC SEPARATION OF A CERAMIC FROM ITS MANDREL

E. W. COVINGTON III
Dec. 1984
LAR-12904 **Vol. 8, No. 2, P. 289**
Thermally sprayed ceramic released from its mandrel by immersing ceramic part and mandrel in cryogenic liquid. Technique takes advantage of difference in expansion coefficients.

B83-10718
PRESSURE/VACUUM BONDING FOR LOW-CURVATURE MIRRORS
P. O. FRICKLAND (CALTECH)
Dec. 1984
NPO-15613 **Vol. 8, No. 2, P. 289**
Pressure/vacuum bonding technique facilitates assembly of large solarconcentrator mirrors. Reflecting surfaces attached to nonreflecting substrates.

B83-10719
FLAME-TEST CHAMBER
R. A. BJORKLUND (CALTECH)
Dec. 1984
NPO-15407 **Vol. 8, No. 2, P. 290**
Experimental chamber provides controlled environment for observation and measurement of flames propagating in expanding plume of flammable air/fuel mixture under atmospheric conditions. Designed to evaluate quenching capability of screen-type flame arresters in atmospheric vents of fuel cargo tanks aboard marine cargo vessels.

B83-10720
AIRLOCK ENTRY
P. O. FRICKLAND (CALTECH) and E. L. CLELAND (CALTECH)
Dec. 1984
NPO-15415 **Vol. 8, No. 2, P. 290**
Proposed airlock retrofitted to air-inflated polymeric domes to accommodate large vehicles. Airlock inexpensive, simple to assemble, adaptable to any terrain and any size required, and requires no external power.

B83-10721
ADJUSTING THE CONTOUR OF REFLECTOR PANELS
W. B. PALMER (TRW, Inc.) and M. M. GIEBLER (TRW, Inc.)
Dec. 1984
NPO-15319 **Vol. 8, No. 2, P. 290**
Postfabrication adjustment of contour of panels for reflector, such as parabolic reflector for radio antennas, possible with simple mechanism consisting of threaded stud, two nuts, and flexure. Contours adjusted manually.

B83-10722
AUTOMATED VARIABLE-POLARITY PLASMA-ARC WELDING
A. NUMES JR., E. BAYLESS JR., S. JONES III, P. MUNAFO, A. MUNAFO, A. BIDDLE, and W. WILSON
Dec. 1984
MFS-27042 **Vol. 8, No. 2, P. 290**
Variable-polarity plasma-arc methods produces better welds at lower cost than gas-shielded tungsten-arc welding in assemblies. Weld porosity very low and costs of joint preparation, depeaking, inspection, and weld minimized.

B83-10723
WELDING TUBES IN PLACE
R. MEREDITH (North American Aviation, Inc.)
Dec. 1984
MFS-25714 **Vol. 8, No. 2, P. 290**
Special welding equipment joins metal tubes that carry pressurized cyrogenic fluids. Equipment small enough to be used in confined spaces in which such tubes often mounted. Welded joints lighter in weight and more leak-proof than joints made with mechanical fittings.

B83-10724
HOT FORMING WITH ELECTRON-BEAM WELDER
R. K. DOBSON (Rockwell International Corp.) and E. L. WHIFFEN (Rockwell International Corp.)
Dec. 1984
MSC-20413 **Vol. 8, No. 2, P. 290**
Hot forming to restore size and shape of thin metal parts done with electron-beam welder. Work-piece heated in scanning defocused electron beam rather than conventional heat-treating furnace. Technique proved successful in straightening some thin flanges of nickel alloy and titanium.

B83-10725
MICROFISSURING IN ALLOYS DURING WELDING
Innovator Not Given (College of Engineering of Clemson University) Dec. 1984
MFS-25604 **Vol. 8, No. 2, P. 291**
Evaluating cause of intergranular cracking (microfissuring) in high-temperature alloys during welding done by measuring number of microcracks as function of temperature and plastic strain. Two mechanisms of microfissuring in heat-affected zones suggested.

B83-10726
ACOUSTIC-LEVITATION CHAMBER
M. B. BARMATZ (CALTECH), D. GRANETT (CALTECH), and M. C. LEE (CALTECH)
Dec. 1984
NPO-16142 **Vol. 8, No. 2, P. 291**
Uncontaminated environments for highly-pure material processing provided within completely sealed levitation chamber that suspends particles by acoustic excitation. Technique ideally suited for material processing in low gravity environment of space.

B83-10727
MONITORING ACOUSTICALLY LEVITATED SAMPLES
T. A. GLAVICH (CALTECH), D. J. KERRISK (CALTECH), J. M. MCLAUCHIAN (CALTECH), J. K. LANGMAIER (CALTECH), and F. R. CHAMBERLAIN III (CALTECH)
Dec. 1984
NPO-15193 **Vol. 8, No. 2, P. 291**
Physical behavior of sample acoustically levitated in high-temperature oven optically monitored by new system. Optical system allows visible and infrared monitoring of sample.

B83-10728
SOLAR-CELL-MANUFACTURING SYSTEM
F. G. KELLY (TRW, Inc.)
Dec. 1984
MFS-25483 **Vol. 8, No. 2, P. 291**
Cost of manufacturing solar arrays minimized by using polyimide-ribbed substrates together with silver-plated coils of low-expansion nickel/iron ribbon on solar cells. Polyimide taped to ribbon protects cell from abrasion or from sticking to other tooling.

B83-10729
AUTOMATED ASSEMBLY OF SOLAR PANELS
J. J. HAGERTY (MB Associates)
Dec. 1984
NPO-16206; NPO-16207; NPO-16208; NPO-16209 **Vol. 8, No. 2, P. 291**
Robot places photoelectric cells in lamination chamber and removes cured panel. Automated process expected to lower cost of solar-panel fabrication.

B83-10730
PURIFYING SILICON DURING CRYSTAL GROWTH
P. J. SHLICHTA (CALTECH)
Dec. 1984
NPO-14831 **Vol. 8, No. 2, P. 291**
Direct current applied to molten silicon during crystallization causes impurities to migrate away from interface of

growing crystal. Method improves purity of crystal without interfering with growth process or requiring additional operator attention.

B83-10731
SILICON-FILM GROWTH BY CONTINUOUS EDGE-SUPPORTED MELT SKIMMING
G. H. SCHWUTTKE (CALTECH) and J. K. LIU (CALTECH)
Dec. 1984
NPO-15532 **Vol. 8, No. 2, P. 292**
Proposed technique grows thin sheets of silicon at high speeds with minimal contamination. Films grown in novel and continuous manner without presence of substrate.

B83-10732
ALINING SOLDER PADS ON A SOLAR CELL
A. G. LAZZERY (RCA Corp.)
Dec. 1984
NPO-15298 **Vol. 8, No. 2, P. 292**
Mechanism consisting of stylus and hand-operated lever incorporated into screening machine to precisely register front and back solder pads during solar-cell assembly. Technique may interest those assembling solar cells manually for research or prototype work.

B83-10733
TERMINAL SYSTEM FOR PHOTOVOLTAIC ARRAYS
T. J. MALONEY (AIA Research Corp.)
Dec. 1984
NPO-15739 **Vol. 8, No. 2, P. 292**
Quick-connect terminal system provides electrical contact and physical alinement between adjacent photovoltaic modules. Dual-ended plugs connect adjacent modules; single-ended plugs connect bus cables. No tools required to insert plugs and no live terminals exposed before, during, or after connection.

09 MATHEMATICS AND INFORMATION SCIENCES

B83-10121
INFORMATION-SYSTEMS DATA-FLOW DIAGRAM
J. O. BLOSIU (CALTECH)
Aug. 1983
NPO-15492 **Vol. 7, No. 3, P. 355**
Single form presents clear picture of entire system. Form giving relational review of data flow well suited to information system planning, analysis, engineering, and management. Used to review data flow for developing system or one already in use.

B83-10122
LARGE-SCALE SOFTWARE MANAGEMENT SYSTEM
G. L. KIRKLAND (International Business Machines Corp.)
Aug. 1983
KSC-11230 **Vol. 7, No. 3, P. 356**
Changes are organized and controlled according to consistent procedures. System contains two sets of libraries: baseline and development. Library is hierarchial catalog and file structure in which catalog levels and entries identify and delineate software components and functions within components. Especially suited to 'multi-flow' environment, in which there is more than one version of each software module

B83-10123
PLANNING TRANSPORT AND MANUFACTURING FOR LOWEST COST
L. A. DAMARIO (CALTECH), D. V. BYRNES (CALTECH), and R. H. STANFORD (CALTECH)
Aug. 1983
NPO-15391 **Vol. 7, No. 3, P. 357**
A method applicable to transportation and manufacturing. New algorithm alleviates some mathematical difficulties of planning segmented trajectories for lowest cost. Algorithm involves modified Newtonian iterative method in which periapse times, closest approach distances, and orientations of approach hyperbolas serves as independent variables.

B83-10124
SHUTTLE INVENTORY MANAGEMENT
(Innovator Not Given) Computer Services Division Aug. 1983
KSC-11219 **Vol. 7, No. 3, P. 357**
Inventory Management System (SIMS) consists of series of integrated support programs providing supply support for both Shuttle program and Kennedy Space Center base opeations SIMS controls all supply activities and requirements from single point. Programs written in COBOL.

B83-10238
DETERMINING NORMAL-DISTRIBUTION TOLERANCE BOUNDS GRAPHICALLY
M. A. MEZZACAPPA (Rockwell International Corp.)
Oct. 1983
MSC-20115 **Vol. 7, No. 4, P. 480**
Graphical method requires calculations and table lookup. Distribution established from only three points: mean upper and lower confidence bounds and lower confidence bound of standard deviation. Method requires only few calculations with simple equations. Graphical procedure establishes best-fit line for measured data and bounds for selected confidence level and any distribution percentile.

B83-10239
HARMONIC-BALANCE ALGORITHM FOR NONLINEAR SYSTEMS
J. R. MITCHELL (Mississippi State University) and O. L. BARRON (Mississippi State University)
Oct. 1983
MFS-25821 **Vol. 7, No. 4, P. 480**
Limit cycles identified in systems with multiple nonlinearities and multiple paths. Feedback control system or other physical system with feedback has several forward signal paths with both linear and nonlinear elements in each path. New algorithm finds limit cycles for systems of this configuration. Applied to systems of general type.

B83-10240
DIGITAL FILTERS FOR TWO-DIMENSIONAL DATA
T. R. EDWARDS
Oct. 1983
MFS-25790 **Vol. 7, No. 4, P. 481**
Computational efficient filters speed processing of two-dimensional experimental data. Two-dimensional smoothing filter used to attenuate high-frequency noise in two-dimensional numerical data arrays. Filter provides smoothed data values equal to values obtained by fitting surface with secondand third-order terms to 5 by 5 subset of data points centered on points and replacing data at each point by value of surface fitted at point. Especially suited for efficient analysis of two-dimensional experimental data on images.

B83-10241
KSC CONSTRUCTION COST INDEX
J. A. BROWN
Oct. 1983
KSC-11252 **Vol. 7, No. 4, P. 482**
Kennedy Space Center cost Index aids in conceptual design cost estimates. Report discusses development of KSC Cost Index since January 1974. Index since January 1974. Index provides management, design engineers, and estimators an up-to-data reference for local labor and

material process. Also provides mount and rate of change in these costs used to predict future construction costs.

B83-10242
CONCEPTUAL COST ESTIMATING
J. A. BROWN
Oct. 1983
KSC-11253 **Vol. 7, No. 4, P. 482**
Kennedy Space Center data aid in efficient construction-cost managment. Report discusses development and use of NASA TR-1508, Kennedy Space Center Aerospace Construction price book for preparing conceptual budget, funding cost estimating, and preliminary cost engineering reports. Report based on actual bid prices and Government estimates.

B83-10243
FROST FORECASTING FOR FRUITGROWERS
J. D. MARTSOLF (University of Florida) and E. CHEN (University of Florida)
Oct. 1983 See Also NASA CR-166827 (N82-20607/NSP)
KSC-11241 **Vol. 7, No. 4, P. 482**
Progress in forecasting from satellite data reviewed. University study found data from satellites displayed in color and used to predict frost are valuable aid to agriculture. Study evaluated scheme to use Earth-temperature data from Geostationary Operational Environmental Satellite in computer model that determines when and where freezing temperatures endanger developing fruit crops, such as apples, peaches and cherries in spring and citrus crops in winter.

B83-10244
SOFTWARE SPECIFICATION LANGUAGE
B. P. BUCKLES (Science Applications, Inc.), J. P. RYAN (Science Applications, Inc.), and S. L. AUSTIN
Oct. 1983
MFS-23737 **Vol. 7, No. 4, P. 483**
SSL translator aids in developing and checking software systems. Goal of SSL is to provide form of verification and consistency checking early in design phase. Serves as formal document to communicate software architecure to detailed designers.

B83-10245
FOREST RESOURCE INFORMATION SYSTEM
R. P. MROCZNYSKI (Purdue University)
Oct. 1983
MSC-20270 **Vol. 7, No. 4, P. 484**
Twenty-three processing functions aid in utilizing LANDSAT data for forest resource management. Designed to work primarily with digital data obtained from measurements recorded by multispectral remote sensors mounted on aerospace platforms. communication between processing functions, simplicity of control, and commonality of data files in LARSFRIS enhance usefulness of system as tool for research and development of remote sensing systems.

B83-10246
SECURITY PACKAGE FOR THE VAX
V. J. MARKS (MATSCO) and C. E. BENIGUE (MATSCO)
Oct. 1983
MSC-20423 **Vol. 7, No. 4, P. 484**
Four programs deal with intruders and resource managment. Package available from COSMIC provides DEC VAX-11/780 with certain 'deterent' security features. Although packages is not comprehensive security system, of interest for any VAX installation where security is concern.

B83-10488
PROCESSING OF SYNTHETIC-APERTURE-RADAR DATA
A. E. DI CENZO (Caltech)
Apr. 1984
NPO-15316 **Vol. 8, No. 1, P. 147**
Ambiguous data combined to permit fast-transform convolution. New data processor designed: two-dimensional ensemble of range-correlated SAR data stored in memory and extracted in format for which azimuth data are colinear.

B83-10489
OBTAINING RUNGE-KUTTA SOLUTIONS BETWEEN TIME STEPS
M. K. HORN
Apr. 1984 See Also NASA TM-58239 (N82-21967/NSP)
MSC-20404 **Vol. 8, No. 1, P. 148**
New interpolation method used with existing Runge-Kutta algorithms. Algorithm evaluates solution at intermediate point within integration step. Only few additional computations required to produce intermediate solution data. Runge-Kutta method provides accurate solution with larger time steps than allowable in other methods.

B83-10490
ALGORITHM FOR CONSTRUCTING CONTOUR PLOTS
W. JOHNSON and F. SILVA (Informatics, Inc.)
Apr. 1984
ARC-11441 **Vol. 8, No. 1, P. 148**
General computer algorithm developed for construction of contour plots. algorithm accepts as input data values at set of points irregularly distributed over plane. Algorithm based on interpolation scheme: points in plane connected by straight-line segments to form set of triangles. Program written in FORTRAN IV.

B83-10491
HIDDEN-LINE COMPUTER CODE
D. R. HEDGLEY JR. (Dryden Flight Research)
Apr. 1984
ARC-11446 **Vol. 8, No. 1, P. 149**
New, efficient solution minimizes run time. Approach based on approved theorem provides formal basis for assuring generality and rapid execution. Theorem does not directly address nuisance of square law growth. Analysis of algorithm shows it tends to avoid square-law growth, and rigorous testing verified algorithm tends to enjoy almost linear growth.

B83-10492
FLOW CHART FOR MANAGEMENT
K. A. BLOM (Caltech)
Apr. 1984
NPO-15014 **Vol. 8, No. 1, P. 149**
Flow chart management tool presents organizational/staffing relationships, resource requirements and time dependent product-activity relationships on single chart.

B83-10493
THREE-LEVEL CONTROL OF MANIPULATORS
R. L. ZAWACKI (Caltech) and M. I. VUSKOVIC (Caltech)
Apr. 1984
NPO-15048 **Vol. 8, No. 1, P. 149**
Concept for control of remote manipulators based on three-level hierarchy allows complex tasks performed in real time. Developed for interactive human/control with sensory feedback.

B83-10494
CONTROL OF SELF-REPLICATING SYSTEMS
G. VON TIESENHAUSEN
Apr. 1984
MFS-25865 **Vol. 8, No. 1, P. 150**
Three concepts proposed for system management and control. Concepts are: internal system for autonomous management and control, separate system for environment monitoring, and optical intelligent system required in especially chaotic environments. Intelligent system responds by making decisions and solving problems in novel situations preprogramed.

B83-10495
TRAINING SIMULATOR FOR FIRE MANAGEMENT
K. A. SMITH, R. C. RODRIGUEZ, J. L. RANDOLPH, and

R. T. HOWARD
Apr. 1984
MFS-25898 **Vol. 8, No. 1, P. 150**
Users manipulate resources in practicing fire-control strategy. Users manipulate resource information displayed on two separate monitors, as computer-generated messages and computer-controlled fire scenes.

B83-10496
GENERATING RANDOM NUMBER PAIRS
C. W. CAMPBELL
Apr. 1984
MFS-27039 **Vol. 8, No. 1, P. 150**
Algorithm generates pairs drawn from bivariate normal distribution with any desired values of two means, two standard deviations, and correlation coefficient.

B83-10734
EFFICIENT CODING FOR OPTICAL COMMUNICATION
R. J. MCELIECE (CALTECH)
Dec. 1984
NPO-15856 **Vol. 8, No. 2, P. 295**
Possibility of using photon counting, rather than conventional linear amplification, for optical communications discussed. Study suggests combination of pulse-position modulation and Reed-Solomon coding gives signaling efficiency of 3 to 4 bits/photon.

B83-10735
A FILE ARCHIVAL SYSTEM
J. L. FANSELOW (CALTECH) and J. L. VAVRUS (CALTECH)
Dec. 1984
NPO-16274 **Vol. 8, No. 2, P. 295**
ARCH, file archival system for DEC VAX, provides for easy offline storage and retrieval of arbitrary files on DEC VAX system. System designed to eliminate situations that tie up disk space and lead to confusion when different programers develop different versions of same programs and associated files.

B83-10736
PSEUDO-RANDOM NUMBER GENERATORS
L. W. HOWELL and M. H. RHEINFURTH
Dec. 1984
MFS-27017 **Vol. 8, No. 2, P. 296**
Package features comprehensive selection of probabilistic distributions. Monte Carlo simulations resorted to whenever systems studied not amenable to deterministic analyses or when direct experimentation not feasible. Random numbers having certain specified distribution characteristic integral part of simulations. Package consists of collector of 'pseudorandom' number generators for use in Monte Carlo simulations.

B83-10737
SPIRE DATA-BASE MANAGEMENT SYSTEM
C. F. FUECHSEL
Dec. 1984
GSC-12684 **Vol. 8, No. 2, P. 296**
Spacelab Payload Integration and Rocket Experiment (SPIRE) data-base management system (DBMS) based on relational model of data bases. Data bases typically used for engineering and mission analysis tasks and, unlike most commercially available systems, allow data items and data structures stored in forms suitable for direct analytical computation. SPIRE DBMS designed to support data requests from interactive users as well as applications programs.

B83-10738
FORTRAN STATIC SOURCE CODE ANALYZER
P. MERWARTH
Dec. 1984
GSC-12724 **Vol. 8, No. 2, P. 297**
FORTRAN Static Source Code Analyzer program, SAP (DEC VAX version), automatically gathers statistics on occurrences of statements and structures within FORTRAN program and provides reports of those statistics. Provisions made for weighting each statistic and provide an overall figure of complexity.

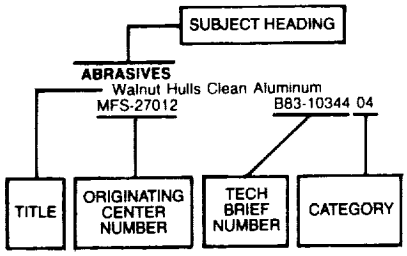
B83-10739
SOFTWARE DOCUMENT INVENTORY PROGRAM
P. D. MERWARTH
Dec. 1984
GSC-12803 **Vol. 8, No. 2, P. 297**
Program offers ways to file and locate sources of reference. DOCLIB system consists of two parts to serve needs of two type of users: general user and librarian. DOCLIB systems provides user with interactive, menudriven document inventory capability.

B83-10740
NAMELIST PREPROCESSOR PROGRAM
P. D. MERWARTH
Dec. 1984
GSC-12711 **Vol. 8, No. 2, P. 297**
NAMELIST Preprocessor Program, NPP, provides DEC VAX with capabilities identical to IBM FORTRAN IV NAMELIST feature. NAMELIST provides FORTRAN programer with additional, flexible input and output capabilities. Input data reviewed without elaborate formatting.

B83-10741
RESEARCH AND DEVELOPMENT MISSION ANALYSIS SYSTEM
W. A. TAYLOR (Computer Science Corp.)
Dec. 1984
GSC-12847 **Vol. 8, No. 2, P. 297**
Research and Development Mission Analysis System, RADMAS, facilitates solution of mission-analysis problems in research and development environment. System centers on executive structure that controls function selection and executing.

B83-10742
MODERN NUMERICAL METHODS FOR CLASSICAL SAMPLED SYSTEM ANALYSIS-SAMSAN
H. P. FRISCH
Dec. 1984
GSC-12827 **Vol. 8, No. 2, P. 298**
SAMSAN aids control-system analyst by providing self-consistent set of computer algorithms that support large-order control-system design and evaluation studies, with emphasis placed on sampled system analysis. Program provides set of algorithms readily integrated for solving control-system problems.

Typical Subject Index Listing



The title of each Tech Brief is listed under several selected subject headings to provide the user with a variety of approaches in his search for specific information. The Tech Brief number, e.g., B83-10344, is located under and to the right of the title and is followed by a two-digit number, e.g., 04, which designates the subject category in which the entire entry can be found.

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ABRASIVES
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MFS-27012 B83-10344 04
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Power-Measurement Errors Due to Instrument Lag
NPO-15029 B83-10516 01
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Acoustical-Levitation Chamber for Metallurgy
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Acoustic Levitation With Less Equipment
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GSC-12640 B83-10027 03
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NPO-15932 B83-10325 03
RADIATION DISTRIBUTION
Estimating Waveguide Feed Directivity and Spacing
NPO-15603 B83-10144 03
RADIATION EFFECTS
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NPO-14995 B83-10364 04
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LEW-13819 B83-10627 06
RADIATION LAWS
Thermal Radiation Analyzer System
GSC-12783 B83-10626 06

RADIATION TOLERANCE
Radiation-Hardness Data For Semiconductor Devices
NPO-15787 B83-10507 01
RADIATIVE HEAT TRANSFER
High-Absorptance Radiative Heat Sink
GSC-12739 B83-10110 08
RADIO ASTRONOMY
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NPO-15932 B83-10325 03
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NPO-15181 B83-10556 03
RADIO FREQUENCIES
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NPO-15030 B83-10283 02
RADIO FREQUENCY DISCHARGE
Improved Coil for Hydrogen Dissociators
MFS-25638 B83-10262 01
RADIO FREQUENCY HEATING
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NPO-15640 B83-10217 08
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MFS-25880 B83-10694 08
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Sideband-Aided Receiver Arrays
NPO-15873 B83-10522 02
RADIO SIGNALS
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NPO-15089 B83-10015 02
Binary Correlator for Electromagnetic Signal Patterns
GSC-12714 B83-10275 02
RADIO TELEMETRY
Linking 'Smart' Modules by a Single Channel
NP0-15342 B83-10134 02
RADIO TRANSMITTERS
Remotely-Operated Traffic Control Light
ARC-11406 B83-10512 01
RADIOACTIVE WASTES
Packaging Nuclear and Chemical Waste for Disposal
NPO-15454 B83-10348 04
RADIOGRAPHY
Neutron Probe of Building-Wall Composition
GSC-12808 B83-10541 03
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LAR-12648 B83-10022 03
Pyrheliometer With Improved Accuracy
NPO-15398 B83-10143 03
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NPO-14986 B83-10313 03
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MFS-25872 B83-10390 06
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Rain and Dew Detector
NPO-15370 B83-10405 06
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MFS-27039 B83-10496 09
RANDOM PROCESSES
Random Life Curves for Common Engineering Materials
MSC-20433 B83-10163 04
RANGE ERRORS
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NPO-15316 B83-10488 09
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GSC-12761 B83-10142 03
RAPID QUENCHING (METALLURGY)
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MFS-25305 B83-10478 08
RARE GAS-HALIDE LASERS
Controlling Metal-Halide Vapor Density in Lasers
NPO-15021 B83-10310 03
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GSC-12783 B83-10626 06
REACTION TIME
Preventing Motor Damage Due to Rapid Reversal
MFS-19702 B83-10676 07
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NPO-15892 B83-10252 01
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NPO-15040 B83-10290 02
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NPO-15355 B83-10536 02
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NPO-15089 B83-10015 02
Sideband-Aided Receiver Arrays
NPO-15873 B83-10522 02
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MFS-25687 B83-10411 07
Status Panel For Video Cassette Recorders
KSC-11254 B83-10532 02
RECOVERABILITY
Wire Retrieves Broken Pin
MFS-19768 B83-10415 07
RECRYSTALLIZATION
Annealing Solar Cells With Lasers
NPO-15694 B83-10120 08
RECTENNAS
Printed Circuit Converts RF Energy to dc Power
LEW-13913 B83-10002 01
RECYCLING
Recycling Lithium Carbonate/Lithium Hydroxide Waste
KSC-11261 B83-10033 04
Bricks and Cans for Thermal Storage
MFS-25625 B83-10315 03
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Coaxial Redundant Drives
MFS-25171 B83-10197 07
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One-Step Coal Liquefaction
NPO-15891 B83-10326 04
Molten Slag Would Boost Coal Conversion
NPO-15711 B83-10327 04
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NPO-15105 B83-10347 04
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NPO-15828 B83-10145 03
Adjusting the Contour of Reflector Panels
NPO-15319 B83-10721 08
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ARC-11331 B83-10041 04
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ARC-11263 B83-10401 06
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Ionic Refrigerator
NPO-15288 B83-10320 03
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ARC-11452 B83-10687 07
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GSC-12771 B83-10408 07
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Improved Two-Phase Switching Regulator
NPO-15172 B83-10267 01
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MSC-20228 B83-10108 08
Low-Weight Inserts for Aluminum Honeycomb Panels
MSC-20227 B83-10116 08
Roof Support Near Coal-Mining Face
NPO1-15165 B83-10431 07
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MFS-19618 B83-10484 08
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Stronger Carbon Fibers for Reinforced Plastics
ARC-11261 B83-10035 04
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MSC-20080 B83-10666 07
Retention Mechanism for Spinning Objects
MFS-25957 B83-10674 07
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Transonic Airfoil Analysis
ARC-11436 B83-10395 06
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MFS-25802 B83-10506 01
RELIEF VALVES
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MFS-19596 B83-10653 06
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NPO-15049 B83-10018 02
Remotely-Adjustable ol Valve
NPO-15693 B83-10404 06
Three-Fingered Robot Hand
NPO-15959 B83-10409 07
REMOTE HANDLING
Remote Manipulator Has Relistic 'Feel'
NPO-15065 B83-10083 07
REMOTE MANIPULATOR SYSTEM
Improving Control of Remote Manipulators
NPO-15049 B83-10018 02
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Radar Cuts Subsoil Survey Costs
KSC-11227 B83-10276 02
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NPO-15692 B83-10307 03
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NPO-15790 B83-10329 04

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MSC-20468 B83-10373 06
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MSC-20337 B83-10093 07
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Staked Bearing Removal Tool
MSC-20337 B83-10093 07
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Cold-Crucible Premelter for Silicon
NPO-16050 B83-10457 08
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GSC-12801 B83-10628 06
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MFS-27015 B83-10304 03
Designing Flat-Plate Photovoltaic Arrays
NPO-15729 B83-10305 03
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GSC-12714 B83-10275 02
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GSC-12847 B83-10741 09
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MFS-27015 B83-10304 03
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LAR-12981 B83-10038 04
Polycarbosilazane-Resin on Process
MFS-25758 B83-10330 04
Improved Thermosetting Imide Resins
ARC-11368 B83-10341 04
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MFS-25825 B83-10137 02
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MSC-20270 B83-10245 09
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KSC-11267 B83-10278 02
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MFS-19790 B83-10685 07
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MSC-20080 B83-10666 07
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ARC-11359 B83-10598 05
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Rhenium Prevents Corrosion
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NPO-14978 B83-10112 08
Improved Radiative Control of Ribbon Growth
NPO-15916 B83-10456 08
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NPO-15919 B83-10458 08
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MFS-25483 B83-10728 08
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MFS-19765 B83-10665 07
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NPO-15150 B83-10070 06
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NPO-15065 B83-10083 07
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MFS-25519 B83-10092 07
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NPO-15959 B83-10409 07
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NPO-15094 B83-10610 06
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NPO-16206 B83-10729 08
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Rhenium Prevents Corrosion
NPO-15011 B83-10361 04
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MFS-25957 B83-10674 07
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LAR-12765 B83-10675 07
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GSC-12742 B83-10169 06
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MSC-20433 B83-10163 04
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MFS-25721 B83-10331 04
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NPO-15662 B83-10148 03
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MSC-20628 B83-10670 07
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MFS-25897 B83-10543 03
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NPO-15580 B83-10028 03
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GSC-12816 B83-10501 01
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MFS-19716 B83-10095 07
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NPO-15350 B83-10135 02
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MSC-20340 B83-10111 08

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MFS-25875 B83-10216 08
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MFS-25922 B83-10487 08
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MFS-19646 B83-10680 07

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MFS-19674 B83-10175 06
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NPO-15163 B83-10366 04
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MFS-19668 B83-10376 06
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MSC-20625 B83-10502 01
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MFS-19892 B83-10652 06
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MFS-19596 B83-10653 06
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MFS-19633 B83-10713 08

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GSC-12714 B83-10275 02

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NPO-15023 B83-10399 06

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MSC-20259 B83-10469 08

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MFS-25865 B83-10494 09

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NPO-15043 B83-10268 01
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NPO-15285 B83-10141 03

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LAR-12938 B83-10004 01

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MFS-25802 B83-10506 01
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LEW-13135 B83-10578 04

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MFS-19708 B83-10681 07

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MFS-19614 B83-10513 01

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NPO-15959 B83-10409 07
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NPO-15048 B83-10493 09

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MFS-19788 B83-10423 07
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KSC-11115 B83-10434 07

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MSC-20283 B83-10688 08

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MFS-25825 B83-10137 02
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MFS-25171 B83-10197 07

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ARC-11384 B83-10180 06

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MFS-25729 B83-10060 06

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MFS-25745 B83-10057 06

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ARC-11384 B83-10180 06
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LAR-12887 B83-10375 06
Shear-Panel Test Fixture Eliminates Corner Stresses
LAR-12930 B83-10383 06

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MFS-25955 B83-10535 02
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MFS-25811 B83-10659 07

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MSC-20452 B83-10220 08

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NPO-15584 B83-10006 01
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NPO-15107 B83-10007 01
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NPO-15688 B83-10511 01

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ARC-11349 B83-10422 07

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NPO-14872 B83-10182 06

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MFS-19753 B83-10656 06

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LEW-13842 B83-10076 06

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NPO-14945 B83-10352 04

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NPO-15525 B83-10537 02

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KSC-11220 B83-10013 02
NRZ Data Asymmetry Corrector and Convolutional Encoder
MSC-20187 B83-10133 02
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NPO-15856 B83-10734 09

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NPO-15874 B83-10273 02

SIGNAL PROCESSING
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NPO-15307 B83-10014 02

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Frequency-Diversity Reception for Phase Modulation
NPO-15040 B83-10290 02
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MFS-25868 B83-10519 01

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NPO-15392 B83-10012 02

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NPO-15510 B83-10357 04
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NPO-15273 B83-10359 04

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NPO-15601 B83-10039 04
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NPO-14978 B83-10112 08
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NPO-15721 B83-10155 04
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NPO-15187 B83-10181 06
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NPO-15916 B83-10456 08
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NPO-15919 B83-10458 08
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NPO-15538 B83-10472 08
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NPO-15356 B83-10473 08
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NPO-15840 B83-10590 04
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NPO-16054 B83-10591 04
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NPO-15282 B83-10253 01

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NPO-15237 B83-10471 08
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NPO-15629 B83-10474 08
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NPO-15532 B83-10731 08

SILICON RADIATION DETECTORS
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GSC-12682 B83-10008 01

SILICON TRANSISTORS
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LEW-13728 B83-10127 01

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Silicone Cerenkov-Radiator Material
GSC-12805 B83-10328 04
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NPO-15510 B83-10357 04

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NPO-15602 B83-10234 08

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GSC-12705 B83-10074 06
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LAR-12926 B83-10392 06

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NPO-15538 B83-10472 08
Shield Boosts Silicon-Growth Rate
NPO-16049 B83-10475 08

SINGLE SIDEBAND TRANSMISSION
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LAR-12716 B83-10509 01

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NPO-15587 B83-10158 04

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MSC-20113 B83-10063 06

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Molten Slag Would Boost Coal Conversion
NPO-15711 B83-10327 04
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NPO-15371 B83-10397 06

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MFS-19685 B83-10716 08

SLIDING
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LEW-13921 B83-10662 07

SLOT ANTENNAS
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NPO-15664 B83-10214 08

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LEW-13951 B83-10572 04

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KSC-11227 B83-10276 02

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MFS-25870 B83-10303 03

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NPO-15741 B83-10129 01
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MFS-25511 B83-10293 03
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NPO-15729 B83-10305 03
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NPO-15908 B83-10450 08
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NPO-15925 B83-10451 08
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NPO-15881 B83-10453 08
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NPO-15628 B83-10566 03
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NPO-15750 B83-10697 08

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NPO-15449 B83-10010 01
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NPO-15676 B83-10011 02
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NPO-15646 B83-10106 08
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NPO-15694 B83-10120 08
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NPO-15755 B83-10126 01
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NPO-15741 B83-10129 01
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NPO-15734 B83-10130 01
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NPO-15158 B83-10139 02
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NPO-15854 B83-10162 04
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NPO-15602 B83-10234 08
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NPO-15484 B83-10295 03
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NPO-15997 B83-10454 08
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NPO-14914 B83-10476 08
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NPO-15481 B83-10477 08
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MFS-25724 B83-10517 01
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NPO-15511 B83-10699 08
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NPO-16140 B83-10702 08
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MFS-25483 B83-10728 08
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NPO-15298 B83-10732 08

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NPO-15731 B83-10223 08
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NPO-15484 B83-10295 03
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NPO-14986 B83-10313 03
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NPO-15419 B83-10316 03
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NPO-15763 B83-10351 04
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NPO-15740 B83-10452 08
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NPO-15667 B83-10561 03
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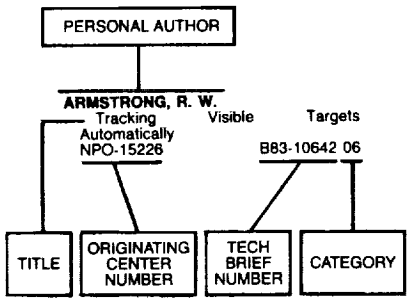

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NPO-15810 B83-10546 03
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MSC-20337 B83-10093 07
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NPO-14998 B83-10291 02
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MFS-19837 B83-10693 08
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NPO-15796 B83-10350 04
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MSC-20439 B83-10202 07
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NPO-14923 B83-10354 04
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LAR-12716 B83-10509 01
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NPO-15844 B83-10292 02
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NPO-15089 B83-10015 02
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ARC-11322 B83-10368 05
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ARC-11263 B83-10401 06
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NPO-15923 B83-10297 03
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ARC-11401 B83-10299 03
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MFS-19608 B83-10514 01
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NPO-16002 B83-10707 08
BROWN, J. K.
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MFS 19859 B83-10619 06
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MFS-19731 B83-10682 07
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MSC-20304 B83-10201 07
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LAR-13073 B83-10528 02
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NPO-15754 B83-10301 03
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KSC-11241 B83-10243 09
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NPO-15550 B83-10184 06
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MFS-19892 B83-10652 06
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MFS-19793 B83-10426 07
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CHIOU, A. E.
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NPO-15892 B83-10252 01
CHRISTIAN, S.
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MFS-19725 B83-10098 07
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ARC-11401 B83-10299 03
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MFS-25957 B83-10674 07
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ARC-11361 B83-10387 06
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NPO-15887 B83-10542 03
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Waterproof Raised Floor Makes Utility Lines Accessible
ARC-11363 B83-10605 06
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MFS-27012 B83-10344 04
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MSC-20078 B83-10045 05
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NPO-15767 B83-10153 04
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LAR-12894 B83-10109 08
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NPO-15603 B83-10144 03
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NPO-15743 B83-10503 01
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KSC-11250 B83-10001 01
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NPO-15391 B83-10123 09
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MFS-25901 B83-10406 06
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NPO-15571 B83-10601 05
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NPO-15938 B83-10455 08
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MFS-19459 B83-10649 06
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MFS 19859 B83-10619 06
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MFS-25771 B83-10711 08
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MFS-27038 B83-10594 04
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NPO-15971 B83-10551 03
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LAR-12884 B83-10105 08
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GSC-12789 B83-10066 06
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MFS-25507 B83-10260 01
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LAR-12259 B83-10165 05
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MFS-25911 B83-10571 04
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NPO-15404 B83-10294 03
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NPO-15908 B83-10450 08
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MSC-20413 B83-10724 08
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MFS-25215 B83-10510 01
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MFS-25773 B83-10160 04
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NPO-15942 B83-10529 02
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ARC-11436 B83-10395 06
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NPO-14988 B83-10579 04
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NPO-15079 B83-10703 08
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MFS-25736 B83-10044 04
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NPO-15881 B83-10453 08
DU FRESNE, E. R.
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NPO-15609 B83-10322 03
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NPO-15806 B83-10370 05
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NPO-16046 B83-10568 04
DUBBLE, E. H.
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NPO-16017 B83-10608 06
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MFS-19796 B83-10689 08
DULIKRAVICH, D. S.
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LEW-13818 B83-10081 06
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LEW-13740 B83-10103 07
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LEW-13854 B83-10189 06
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NPO-15938 B83-10455 08
DUNCAN, C. S.
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NPO-15356 B83-10473 08
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MFS-19728 B83-10435 07
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MFS-25829 B83-10460 08

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LAR-12648 B83-10022 03
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MFS-25871 B83-10525 02
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GSC-12759 B83-10059 06
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NPO-15411 B83-10575 04
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NPO-15037 B83-10444 07
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MSC-20103 B83-10032 04
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NPO-15070 B83-10229 08
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MFS-25485 B83-10647 06
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MSC-20283 B83-10688 08
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GSC-12762 B83-10701 08

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LAR-12785 B83-10646 06
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MORROW, R. B.
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NPO-15693 B83-10404 06
MORSE, B. J.
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NPO-15628 B83-10566 03
MORTENSEN, G. D.
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MUELLER, W. A.
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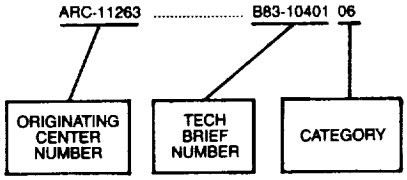

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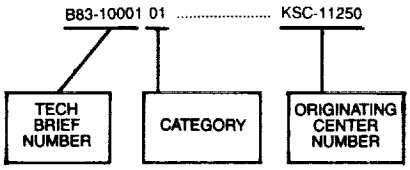

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