DONALD C. BARKER

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CORE STRENGTHS

A multi-discipline expert with knowledge, skills and experience regarding engineering, operations, project management and scientific research. Professional goals and interests include creative and efficient application of diverse concepts, principals, and experimental techniques to solve complex problems.

Professional Experience and Expertise: Project/Operations Management, Project Engineering, System Engineering, Systems Analysis/Integration, System Operations/Safety, Requirements/Procedure Development, Risk Mitigation, Managing Resources, Cultivating Client/Staff Relationships, Meets Business/Engineering/Science Objectives, International Experience, Meets Time/Budget Guidelines, Technology Assessment/Development, Mission/Architecture Design, Increase Efficiency and Optimize Solutions, Application/Programming Experience, Teaching, Research, Aviation, Human Space Flight, Planetary Exploration and Resources, Spacecraft Systems, Life & Physical Sciences, Geology, Psychology/Human Factors, Teamwork, Continuous Personal Improvement.

EDUCATION

Doctorate of Philosophy in Geology
University of Houston, Houston, TX — In work: Pending May 2016

Masters of Science in Space Architecture
University of Houston, Houston, TX — May 14, 2005

Masters of Science in Mathematics
University of Houston-Clear Lake, Houston, TX — May 16, 2003

Masters of Arts in Psychology
University of Houston-Clear Lake, Houston, TX, — May 13, 1995

Masters of Science in Physics
University of Houston-Clear Lake, Houston, TX, — May 08, 1993

Bachelor of Science in Physics; Second Major in Psychology;
Minor, Mathematics — December 14, 1991
Colorado State University, Fort Collins, CO

WORK EXPERIENCE

ISS Physical Sciences, Facilities and Technology Demonstration Specialist
Hamilton Sundstrand — 2011 to 2013

Staff scientist and technical specialist for the International Space Station Program Science Office. Custodian and program knowledge integrator regarding Physical Sciences, Research Facilities, External Payloads and Technology Demonstration investigations. Provide multidisciplinary expertise with knowledge and experience in systems engineering and the space, physical and life sciences. Develop, review/edit, coordinate and maintain historical science summary information as part of the ISS Research and Results Database and other NASA websites. Coordinate and integrate science objectives and program data needs across disciplines and agencies and between PI team members, develop science results database inputs, support ISS Program Scientist in assigning program deliverables and assessing science requirements, objectives and priorities. Author and edit reviews and public information per ISS program science requirements, including drafting ISS research capability and status briefings, research overviews,

and scientific articles, appropriate to a variety of target audiences. Act as the program point of contact for Principle Investigators for each category of scientific investigation and facility. Conduct special studies of relevant issues, requirements and processes that affected Research Integration Office interests by working with the user community, appropriate Space Station working groups or teams, and user sponsors. Produce white papers, study reports and publications that represent ISS research programs, results and achievements. Attend and presented ISS science accomplishments at conferences and workshops.
- Developed the ISS Facilities Utilization information brochure/manual for user and public audiences.

MSS Robotics System Engineer/Manager
Hamilton Sundstrand 2007 to 2011

System engineering and subsystem management expert for the Flight Robotic Systems Branch and Extravehicular Robotic Operations (EVR) systems console of the International Space Station. Provide sustaining engineering of the Mobile Servicing System (MSS) hardware and software. Provide technical oversight for investigating and recommending solutions for in-flight and ground-based system anomalies and operations. Responsible for tracking and evaluating overall and integrated systems performance, recommending systems design and performance trade-offs and developing efficient and safe solutions to complex systems integration problems. Author system requirements and identify and resolve issues. Provide oversight of interface control documentation, system design changes, flight rules and operational procedure verification and certification, accurate and timely in-flight anomaly investigations and review item dispositions (RID). Expert knowledge in the following areas: space environment operations and systems, project engineering and management; systems analysis, integration, operations safety; Common Mode Failure Analysis (CMFA) and systems engineering, analysis, test and verification. Cultivate positive and efficient relations and technical communications with the JSC/NASA customer, COTS vehicle providers, international partners, and hardware and software system developers.
- Lead Mission Evaluation Room (MER) EVR flight controller.
- Lead Increment EVR flight controller for first H-II Transfer Vehicle (HTV) mission to ISS.
- Obtained ISS crew/ground robotic operator hardware and procedures familiarization and training.

Crew Health Care System Engineer/Manager
Hamilton Sundstrand 2004 to 2007

Perform system management and engineering tasks by providing hardware oversight for the Health Maintenance System (HMS) and Environmental Health System (EHS) of the ISS Crew Health Care System (CHeCS). Manage, guide, coordinate, and integrate efforts to ensure continuous availability of crew health care resources and countermeasures. Coordinate with Flight Surgeon communities to enable appropriate and complementary research activities were supported by console personnel and appropriate hardware was available for use. Develop, review and approve flight manifest requests for CHeCS hardware. Monitor and review proposals for advanced technologies and applications for potential inclusion as space flight countermeasures. Provide reviews and coordinate integrated system responses to system ISSP Change Request (CR) traffic. Responsible for the development, verification, certification and integration of new hardware systems and requirements. Provide expert knowledge in systems engineering, sustaining engineering, system analysis, project management of space systems, space flight operations and requirements, hardware development, life cycle engineering requirements including safety and quality assurance, test planning and procedure review, system & element integrated testing, safety reviews and assessments, mission operations planning and implementation and system and element hardware & software acceptance reviews. Manage the track real-time on-orbit CHeCS systems and report to the ISS Program and engineering directorate on issues and resolutions. Responsible for on-orbit problem resolution, planning, resource and activity prioritization, team response as required for optimum resolution of system issues.
- Served as acting Lead for the HMS System Problem Resolution Teams (SPRT).
- Lead Mission Evaluation Room (MER) CHeCS flight controller.
- Optimized/standardized console procedures, operations, training and certification.

- Developed CHeCS process and procedures detailing on-board waste-management and fight hardware manifesting.
- Implemented a lessons learned forum for problems encountered during operational activities.
- Obtained ISS crew member Medical Operations hardware and procedures familiarization and training.

Operations Planning Flight Control
United Space Alliance 2000 to 2004

Space flight operations and planning specialist for the ISS Operations Planning group within the Mission Operations Directorate (MOD) of the International Space Station program. Provide 24/7 Mission Control Center (MCC) console support. Responsible for on-board LAN operations including data routing, crew mail coordination and space-to-ground operational data transfers. Author and coordinate protocols, operations concepts, and training timelines for generic ISS simulations. Support the development of the ISS integrated on-orbit timeline. Coordinate development of SIM products with the ISS Training Division (DT) and International Partners. Develop requirements, GUI tools and coordinate the integration and definition of commands and telemetry for the Timeliner automated procedure management, automated operations monitoring and scheduling tool.
- Certified Multi-Purpose Support Room (MPSR) Real-time Planning Engineer Support (RPE Support) officer and Orbital Communication Adapter (OCA) officer.
- Developed the Operations Planning Group SIM Handbook.
- Obtained regular Russian language instruction and general systems training via the DT Part Task Trainer (PTT).

Guidance, Navigation, Control and Propulsion Flight Control
Barrios Technology 1996 to 2000

Space flight operations and systems expert for the ISS Motion Control Systems (MCS) group. Provide Mission Control Center (MCC) console support for the Guidance, Navigation, Control, & Propulsion systems of the International Space Station program. Member of the Houston Support Group (HSG) and provided MCS and EPS console support and procedure development in Mission Control Moscow (TsUP) from April 1st until July 31st, 1999; including real-time STS96/2A.1 operations support. Obtained cross systems training as an EPS Multi-Purpose Support Room (MPSR) flight controller (POWER). Certified as Russian Interface Officer (RIO) and provided MCC mission support during Phase 1 MIR rendezvous operations. Develop, integrate, and document system level requirements and procedures. Review load, rigid body and flexible body dynamic analyses with regards to propulsion and CMG operations for flight readiness reviews. Responsible for developing, validating and integrating the first MCS procedures and displays for commanding and monitoring on-board GNC systems and hardware. Support system operations development with the prime station contractors concerning system management and command and control systems integration. Responsible for assessing, coordinating and validating operational needs with respect to MCS command and telemetry data requirements. Design and implement training scenarios using the GITF (GN&C Integrated Testing Facility) for MCS flight controllers, training division representatives and crew-members. Additional knowledge and experience included international travel, knowledge of export control, operational negotiations and partner relationship building.
- Certified Multi-Purpose Support Room (MPSR) HAWKI flight controller
- Obtained weekly Russian language instruction.
- Designed, tested and validated a suite of command and control system/user software graphical interface displays for flight controllers and crews. Displays and operational procedures were co-developed and integrated for safety and human factors providing an intuitive and efficient user interface; operationally in use for past 20 years.

Biomedical Engineer
Krug Life Sciences 1992 to 1996

Experimental research expert for the Johnson Space Center Cardiovascular, Environmental

Physiology, Motor Performance and Neuroscience laboratories. Responsible for safely conducting ground based, pre and post flight and inflight experiments and studies. Work directly with the Flight Surgeons and research scientists to implement scientific protocols established by a research plan and to successfully mitigate program risks associated with adaption to space flight and return to Earth. Responsible for managing and integrating science objectives and experimental research efforts directed toward understanding the effects of space flight adaptation on human physiological processes and performance. Develop plans and coordinate inputs for guiding space biology research and technology development activities associated with Detailed Supplementary Objectives (DSO), LBNP, pre/post flight physiological assessments and studies at JSC, KSC, Dryden and Star City Russia. Manage the planning, scheduling, and coordinating resources to ensure completion of research efforts safely and efficiently across organizations and agencies. Manage and integrate science performed pre/post flight and training of Shuttle-Mir Phase I flight crews at JSC and Star City Russia. Responsible for experiment operation, data collection and training of US and International Partner crew members and scientists.

Responsible for echo-doppler data collection in hypobaric and hyperbaric chamber studies assessing physiological responses to space flight and astronaut physical training. Conducted ground based anaerobic and aerobic exercise testing regimes for inclusion in a relational database for future manned space flight applications. Conduct research and development (R&D) formulation and implementation for the design and integration of flight hardware, including the LCVG and DSO603 experiment. Perform thermal performance and equipment evaluations of the Liquid Cooling and Ventilation Garment (LCVG) for use in the Orbiter Launch and Entry Suits (LES).

Perform real time support of experiments and procedures in the JSC Science Monitoring Area. Provided hardware and experiment support during crew training simulations in the WETF, CCT, GNS, SMS and Space Lab mockups. Design and evaluate procedures and protocols for human experiments. Develop plans to ensure that all scientific or technological activities were aligned with the Space Life Sciences directorate's program schedules, costs, and milestone deliverables and supported milestone and flight reviews. Responsible for analysis and management of in-flight and ground-based experimental data. Draft and review new research and grant proposals for NASA cardiovascular and exercise physiology physicians and scientists. Evaluate and test technologies and hardware for use in human testing and experimental and flight hardware for performance and safety. Monitor and train human test subjects for ground bases studies. Responsible for designing and implementing human research experimental protocols while complying/maintaining overall NASA health and safety standards.

- Certificated CTV (Crew Transfer Vehicle) and KC-135 experimental operations participant, and lead experiment operator on CTV and during KC-135 parabolic flights.
- Test subject, crew, experiment and hardware safety and reliability enhancements and assurance.

UNIQUE EXPERIENCE

Lunar & Planetary Institute Research Assistant: Since 1998, have provided support for the organization and operation the biannual Mars Polar Science (venues: Houston, Iceland, Canada, Switzerland and Alaska) and the Early Mars (venue: Jackson Hole) conference series.

Certified Flight Instructor: Since 1991, have provided primary and advanced flight instruction. Flight experience includes the piloting of 14 different Make and 28 Models of aircraft.

Space Exploration and Industry:

1 Selected by the NASA Astronaut Office to the Highly Qualified group during the last three selections (top 10% of all applicants).

2 Selected by the Mars Society in February 2002 to support the second crew rotation during a two-week isolation simulation at the Utah analogue research site (Mars Desert Research Station, MDRS), serving as executive officer, supporting simulation and operations design and developed the first operations, systems and mission rules manuals for the facility. Generally assessed analogue site use and developed constraints for future site selection and use with the intent of supporting crew and mission designer training for piloted missions to Mars.

3 In 2003 initiated Mars Advanced Exploration and Development, Inc., in order to provide a venue for the development of concepts, hardware and operations for the advancement of the human exploration and colonization of Mars. Efforts to date have been directed towards the development of a prototype acoustic system for a Mars EVA suit, software for the selection of human and robotic landing sites on Mars, the design of Martian water reclamation systems, wind turbines, and novel Mars vehicles and relevant mission architectural components.

Field Experience:

- Supported University of Reykjavik/Hawaii Principle Investigators with astrobiology/geology field research operations in Iceland (summer 2004 field season).
- Organized high altitude mountaineering expeditions to Kilimanjaro (2005) and Aconcagua (2010/2012).
- Supported the Imaging Magma Under St. Helens (iMUSH) seismic instrumentation deployment, installation and data collection in Washington (July 2014).

Geology Research Experience (PhD in Work): Completed 45 graduate level credit hours in geology and presently conducting independent research on Apollo 15 and 17 microscopic lunar regolith samples using Electron Probe Micro-Analysis (EPMA: CAMECA SX50 and JEOL JXA-8600 "Superprobe"), Scanning Electron Microscope (SEM: JEOL JSM6330F), Energy Dispersive Spectrometry (EDS) and Laser ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). Analysis of regolith also conducted using visible, near-IR, thermal IR, and hyperspectral techniques. Experience with clean room operations and sample preparation. Key questions being addressed in present studies include lunar volcanism, petrological genesis of volcanic glasses, chemical abundances, and lunar mantle evolution and origin and lunar resource abundances/uses. Additional research includes Mars hydrological cycles, pore-space, sedimentation and sequence stratigraphy. Knowledge and experience in micron scale sample preparation and mounting, field geology techniques, remote sensing/spectral analysis and processing. Hired as a Teaching Assistant (TA) for mineralogy (fall 2014 semester).

UH Graduate Certificate in Geographic Information Systems (GIS) – 2009:

- Completed a series of courses that focus on the acquisition, storing, visualization, modeling, and analysis of information with emphasis on geophysical applications. Software experience: ArcGIS, ENVI, Photoshop, Matlab.

PUBLICATINS/PRESENTATIONS/WORKSHOPS

Barker, D. C. and Snow, J. E., Phenocryst growth and compositional inhomogeneity of Apollo 17 glass spherules. 43rd Lunar and Planetary Science Conference, Houston TX, abstract no. 2926, March 2012.

Barker, D. C., 2012, Moon Under a Microscope, The Explorers Club Journal, New York, NY.

Barker, D. C., Mars northern lowland sequence stratigraphy: First International Conference on Mars Sedimentology and Stratigraphy, El Paso, TX, Abstract 6051.

Parker, T. J. and Barker, D. C., Ocean sediments in the northern plains: First International Conference on Mars Sedimentology and Stratigraphy, El Paso, TX, Abstract 6053, 2010.

Barker, D. C., Solar System Longboats: A Holistic and Robust Mars Exploration Architecture Design Study. Paper: Presented at the AIAA SPACE 2008 Conference & Exposition, American Institute of Aeronautics and Astronautics, AIAA 2008-7881, San Diego California, September 9-11, 2008.

Barker, D. C., Building Inspiration, Motivation & Our Future. AIAA Horizons News Letter, http://www.aiaa-houston.org/, AIAA, July/August 2006.

Barker, D. C., et al., Lunar Development and Exploration: A Simple, Long Lasting and Functionally Adaptable Architecture. Paper: Presented at the 24th National Space Development Conference 2005, National Space Society, Washington D.C., May 19, 2005.

Barker, D. C., Mars, the Only Goal for Humanity. The Space Review, http://www.thespacereview.com/,

Monday, December 13, 2004.

The Life and Biological Sciences (LaBS) Facility: An Evolution in Space Station Design. Paper: Presented at Space 2004, American Institute of Aeronautics and Astronautics, AIAA 2004-5979, San Diego California, September 28-30, 2004.

Barker, D. C., Mars Mission Planning: The Next Step. American Astronautical Society, AAS 03-326, Mars Expedition Planning, Vol. 107, 431-438, http://www.univelt.com/htmlST/htmlMars/v107stco.htm, 2004.

Mars Mission Optimization Based on Collocation of Resources. Abstract & Poster: Provided for the 6th International Conference on Mars, Pasadena, California, July 20-25, 2003.

Evaluating Analogue Sites in Preparation for Long Duration Human Exploration of the Moon and Mars. Abstract and presentation at the *Workshop on Analogue Sites and Facilities for the Human Exploration of the Moon and Mars*, Golden Colorado, May 21-23, 2003.

Barker, D. C., Invited Panel Member for *Planning and Scheduling for Human Space Missions*, 3rd International NASA Workshop on Planning and Scheduling for Space, Houston, Texas, October 27-29, 2002.

Martian Resource Locations: Identification and Optimization. Accepted for publication in Acta Astronautica, 53rd International Astronautical Congress, IAC-02-IAA.13.3.07, 2002.

Martian Resource Locations - Identification and Optimization. Abstract: Presented at the 2nd World Space Congress, Houston, Texas, August 14-19, 2002.

Metrics for Determining the Optimal Locations of Resources. Abstract: Presented at the 5th International Mars Society Convention, Boulder Colorado, August 09, 2002.

Barker, D. C., The Need to Colonize. Ad Astra, 14(4), 32-34, July/August 2002.

Kirkland, Mustard, McAfee, Hapke and Ramsey, Editors, Mars Infrared Spectroscopy: from the Theory and the Laboratory to Field Observations. Lunar and Planetary Institute Workshop Report, Houston Texas, June 4-6, 2002.

The Need to Explore Mars. Abstract: Presented at the National Space Society 21st Annual International Space Development Conference and Exhibition, Denver Colorado, May 23-27, 2002.

Exercising Martian Resource Utilization Technologies at Analogue Sites. Abstract: Presented at the 4th Annual Mars Society Convention, Palo Alto California, August 23, 2001.

Identification, Display, and Optimization of Martian Resource Locations. Abstract: Presented at the 4th Annual Mars Society Convention, Palo Alto California, August 23, 2001.

Mars Surface Suit External Audio System. Abstract: Presented at the 4th Annual Mars Society Convention, Stanford University, Palo Alto California, August 23, 2001.

Mars Surface Suit External Audio System. Abstract: Presented at the 2001 Space Systems Conference, Houston Texas, January 2001.

Mars Exploration Strategy Based on Local Resource Identification. Abstract: Presented at the 3rd International Mars Society Convention, Toronto Canada, August 23, 2000.

Design and Resource Requirements for Successful Wind Energy Production on Mars. Proceedings of the 2nd International Mars Society, Vol. 2, August 14, 1999.

Design and Resource Requirements for Successful Wind Energy Production on Mars. Abstract: Presented at the 2nd International Mars Society Convention, Boulder Colorado, August 14, 1999.

Martian Exploration and Related Terrestrial Social Returns. Abstract: Presented at the Founding Convention of the Mars Society, Boulder Colorado, August 13, 1998.

Surviving on Mars without Nuclear Energy. Proceedings of Founding Convention of the Mars Society, Vol. 3, August 1998.

Surviving on Mars without Nuclear Energy. Abstract: Presented at the Founding Convention of the Mars Society, Boulder Colorado, August 13, 1998.

Site Selection on Mars Based on Optimal Collocation of Indigenous Resources. Abstract: Presented at the Founding Convention of the Mars Society, August 13, 1998.

Resource Utilization and Site Selection for a Self Sufficient Martian Outpost. Poster session: The Space 98 and Robotics 98 Conference, Albuquerque New Mexico, May 1998.

Resource Utilization and Site Selection for a Self Sufficient Martian Outpost. NASA Technical Memorandum, TM-98-206538, April 1998.

Cardiovascular and Valsalva Response During Parabolic Flight. Journal of Applied Physiology, 85(5), 1957-1965, 1998.

Cardiovascular and Valsalva Response During Parabolic Flight. Abstract: Presented at the 12th Man in Space Symposium, Washington D. C., June 1997.

INTERESTS AND ACTIVITIES

Flying, foreign languages (proficient in Russian, Japanese and Spanish), SCUBA diving, mountaineering (Colorado 14'ers, Mt. Fuji, Kilimanjaro & Aconcagua), traveling (visited 34 different countries), Technician Class HAM radio operator (KE5FEV), speleology/caving, playing instruments (e.g., guitar. bodhran), sky diving, astronomy, martial arts (Aikido), science fiction, writing, horticulture (i.e., succulents), inline skating, military vehicle restoration and member of the Wings Over Houston air show staff and the Tora Bomb Squad & Pyro-Boyz air-show pyrotechnic teams (supporting the ToraToraTora historical flight reenactment team).

ORGANIZATIONAL AFFILIATIONS

Association of Mars Explorers
- Selected to board of directors in Spring 2013

Aircraft Owners and Pilots Association

American Institute of Aeronautics and Astronautics
- Senior Member
- Space Architecture Technical Committee (SATC) Member
- Elected Councilor for AIAA Houston section

Geological Society of America

Human Factors and Ergonomics Society

Mars Society

Moon Society

Planetary Society

National Association of Flight Instructors

National Space Society

Society of Exploration Geophysicists

Texas Speleological Association

The Explorers Club
- Elected Treasurer for Texas Chapter