

Curriculum Vitae - Alexander Hoehn, Ph.D.

Principal Engineer – Ball Aerospace and Technologies Corporation, Boulder, Colorado

Associate Professor (Research) - Aerospace Engineering Sciences - University of Colorado at Boulder

Professional Experience:

- Sep.'07 - present **Principal Engineer** at **Ball Aerospace and Technology Corporation** in Assembly, Integration and Test for Commercial and Operational Space / remote sensing satellites.
- Sep. '95 - present **Associate Professor, Adjunct** (2007), **Associate Professor, Research** (2004) / **Assistant Professor, Research** (1995), Aerospace Engineering Sciences, University of Colorado at Boulder. Instruct aerospace design classes, bioastronautics electives, and undergraduate aerospace electronics classes. Advise Senior Design lab groups, M.S. and PhD. candidates, and supervise undergraduate and graduate research assistants.
- July '99 – Sep'07 **Associate Director of Engineering** (7/99) at **BioServe Space Technologies**, responsible for spaceflight payload development, integration and operation and space life sciences experimentation. Participated in, and now manage hardware design, manufacture, test and successful spaceflight operations on 25 Space Shuttle / Space Station flights with 12 different payload designs for biotechnology, plant growth and fluid research. The payloads include biotechnology experiments, plant growth chamber designs, refrigeration / temperature-controlled incubators and beverage dispenser / fluid management systems for microgravity research aboard the Space Shuttle and the International Space Station. Managed the R&D team of staff engineers, technicians and numerous undergraduate and graduate students. Responsible for safety, quality and payload verification. Mechanical, thermal and electronics design lead.
- Jan. '94 - Aug. '95 **Research Associate** at **BioServe Space Technologies**, University of Colorado at Boulder. Managed spaceflight hardware design for plant growth in space, the Space Shuttle and satellite payloads. Payload manager for the Fluids-GBA payload aboard STS-63 and STS-77, as well as the Plant-GBA payload aboard STS-77, and the Plant-Module for Autonomous Space Support aboard the METEOR rocket launch. Supported plant research activities at BioServe Space Technologies and supervised graduate student researchers. Taught space life sciences and senior / graduate level engineering design classes.
- Jan. '90 - Dec. '93 **Research Assistant** at **BioServe Space Technologies**, University of Colorado at Boulder. Managed Advanced Life Support Systems research group (plant production in space, experimental plant physiology). Managed subcontract 'Lunar CELSS' for Lockheed Missile and Space Corp. Designed flight hardware for microgravity research (KC-135, sounding rocket, space shuttle, METEOR rocket / satellite: biomaterials processing, plant growth, animal habitat). Mission operations team lead at the Payload Operations Control Center (POCC) in Huntsville.
- Aug. '88 - Dec. '89 **Post-Graduate Research Fellow** of the German Academic Exchange Service, DAAD, at the Aerospace Engineering Sciences department / **University of Colorado at Boulder**. Researched bioengineering and plant physiology for advanced life support systems.
- Aug. '87 - July '88 **Young Graduate** (staff engineer) at the **European Space Research and Technology Center** / European Space Agency (Noordwijk, the Netherlands). Supported Advanced Technology Engine study sub-contract for the chemical propulsion division, and meteorite / space debris related projects (testing, experimentation, model calculations) in continuation of previous research work in Munich.
- Oct. '84 - July '87 **Research Assistant** at the **Hypervelocity Accelerator Facilities** of the Technical University Munich, Germany (Astronautical Engineering). Researched high velocity accelerators for micro meteorite and space debris simulation.

May '84 - Dec. '85 **Associated Engineer** for BMW (Munich, Germany) in the CAD software design and support division: designed application programs for CAD-design engineers, trained design engineers on CAD systems (VAX / CD2000).

Academic Education:

Jan. '90 - Dec. '93 **University of Colorado, Boulder** - *Doctor of Philosophy* in Aerospace Engineering Sciences / Bioengineering. (GPA: 3.96 on a scale of 4.00).
Doctoral Thesis: "Effects of Gravity and Light on Plant Growth and Performance in Normal and Reduced Gravity." Advisor: Prof. Marvin W. Luttges, Aerospace Engineering Sciences, University of Colorado, Boulder.

Aug. '88 - Dec. '89 **University of Colorado, Boulder** - *Master of Science* in Aerospace Engineering Sciences / Bioengineering: emphasized advanced (biological) life support systems - plant physiology (GPA: 3.90 on a scale of 4.00).

May '84 - June '87 **Technical University Munich** - "*Diplom Ingenieur*" (Diploma / Master degree) in Aerospace and Mechanical Engineering "*mit Auszeichnung*" (with special honor: GPA converted to U.S. system: 3.70 on a scale of 4.00).
Master Thesis: "Theoretical and Experimental Investigations for a Two-Stage Accelerator." Based on research done at the Hypervelocity Accelerator Facility for space debris and meteorite simulation, Astronautical Engineering Department. Advisor: Prof. Dr. Ing. Harry O. Ruppe / Dr. Martin Rott, Technical University Munich, Germany.

Oct. '81 - March '84 **Technical University Stuttgart** - Aerospace Engineering Department. *Pre-diploma* in Aerospace Engineering (i.e., undergraduate degree), Stuttgart, Germany.

Teaching Experience:

1991 - present Teach junior, senior and graduate level classes at the University of Colorado, Aerospace Engineering Sciences. Classes include ABET capstone design classes, Space Habitation Design, Spaceflight Hardware Design, Introduction to Space Life Sciences, BioSpherics and Life Support, Introduction to Space Experimentation, Senior Design Lab, Bioengineering and Instrumentation, and Aerospace Electronics and Communication.

Apprenticeship/ Internship:

April 1984 Internship - aerospace engineering, **Messerschmidt Bölkow Blohm (MBB)**, Ottobrunn - helicopter division - structures design.

Oct. '83 - Dec. '83 Internship - aerospace engineering; **Messerschmidt Bölkow Blohm (MBB)**, Hamburg: transport aircraft division: assembly, design, quality control.

July '83 - Aug. '83 Apprentice course aerospace engineering / mechanical engineering; **Daimler Benz AG**, Stuttgart: assembly, casting, modeling - aluminum and cast iron.

April '81 - June '81 Apprentice course aerospace engineering; **Daimler Benz AG**, Stuttgart: basic machinist and metal working education.

March '81 - April '81 Instruction course: welding (electric arc / gas).

Fellowships / Honors:

2008 SAE Forest R. McFarland Award for outstanding contributions toward the work of the SAE Engineering Meetings Board (EMB).

1996 Certificate of Appreciation, Spacehab Inc., for significant contribution to the Spacehab-04 mission / STS-77.

1995 NASA recognition for support of the USML-2 / STS-73 Spacelab mission.

1992 NASA recognition for outstanding support to the USML-1 / STS-50 Spacelab mission.

1988 / 1989 Post-Graduate Fellow of the German Academic Exchange Service (DAAD).

1987 Graduated with highest honors ("mit Auszeichnung"), Diplom-Ingenieur (Master of Sciences), Aerospace / Mechanical Engineering, Technical University Munich.

1979 Graduated with highest honors ("mit Auszeichnung"), Wagenburg Gymnasium, Stuttgart (science-oriented high school).

Professional Organizations:

since 1990 American Society of Gravitational and Space Biology, ASGSB.
since 1989 American Institute of Aeronautics and Astronautics, AIAA.
since 1993 American Society for Engineering Education, ASEE.

Languages:

Fluent in German (native tongue), and English. Working (French) and basic knowledge in Italian, Dutch, and Spanish.

Computer Skills:

Windows-based office and analysis software, data acquisition and control, computer aided design (AutoCAD R14 / Mechanical Desktop, ORCAD); computer maintenance / user support. Flight software development for BioServe's stand-alone spaceflight experiments (Polycode, C++, DOS, Linux). Operations and Science Instrument Support - Command and Control package (OASIS-CC).

Personal Data:

Born April 18, 1960 in Stuttgart, Germany. German and USA citizenship.
Extracurricular interests include skiing, biking, sailing, SCUBA, mountaineering.

Service Activities

- Serve on graduate selection committee, facilities and safety committee, and the Senior Projects Advisory Board for the Aerospace Engineering Sciences department.
- Perform outreach activities for Women in Engineering, Space Grant College, and local K-12 schools for space-related space science modules.
- AIAA Life Sciences Subcommittee, co-chair and co-organizer for Space Experimentation session during SAE-sponsored ICES (International Conference on Environmental Systems) conferences.

Patents

United States Patent, 5,947,334 (Rudick, et al.), Sept. 7, 1999. "*Post-mix beverage system for use in extra-terrestrial space.*" Rudick, Arthur G. (Atlanta, GA); Gupta, Ashis (Marietta, GA); Myers, Michael J. (Lawrenceville, GA); Kjorlaug, Christopher C. (Alpharetta, GA); Hoehn, Alexander (Boulder, CO); Stodieck, Louis S. (Boulder, CO); Horner, Michael B. (Boulder, CO); Edwards, Mark T. (Boulder, CO); Sterrett, Kirsten S. (Westminster, CO); Genova, Jon A. (Boulder, CO); Rupert, Mark A. (Boulder, CO). The Coca-Cola Company (Atlanta, GA). Filed: May 17, 1997.



For a complete list of publications, see <http://spot.colorado.edu/~hoehn/publication-by-year.htm>

For additional information, see: <http://myprofile.cos.com/hoehna1>

Publications - Hoehn

2008

A. Hoehn, K.L. Lynch, P. Koenig, H. Schweiger, I.I. Brown, C. Galindo, J. Kapit, S.M.M. Young, S. P. Kounaves (2008): "The Microbial Detection Array (MiDA)—Prototype Test Results", Astrobiology Science Conference 2008, AbSciCon, Poster 2-07-P.

H.D. Seelig, A. Hoehn, L.S. Stodieck, D.M. Klaus, W.W. Adams, and W.J. Emery (2008): "The assessment of leaf water content using leaf reflectance ratios in the visible, near-, and mid-infrared." *International Journal of Remote Sensing*, 29:13, 3701 — 3713. URL: <http://dx.doi.org/10.1080/01431160701772500>.

2007

H.D. Seelig, A. Hoehn, L.S. Stodieck, D.M. Klaus, W.W. Adams, and W.J. Emery (2007): "Relations of remote sensing leaf water indices to leaf water thickness in cowpea, bean, and sugarbeet plants." *Remote Sensing of Environment*, 112: 445-455, doi:10.1016/j.rse.2007.05.002

A. Hoehn, S. Countryman, J.B. Freeman, K.K. Gifford, C.V. Goulart, W. Kalinowski, P. Koenig, S. Kuzminski, S. Williams, L.S. Stodieck (2007): "Science Research and Education Modules for the CGBA Spaceflight Incubator," *SAE-paper 2007-01-3188*.

A. Hoehn, I. Brown, J. Clawson, J.B. Freeman, J. Kapit, K.L. Lynch, S.M.M. Young, S.P. Kounaves (2007): "Microbial Detection Arrays (MiDAs), a Novel Instrument for Unambiguous Detection of Microbial Metabolic Activity in Astrobiology Applications", *SAE-paper 2007-01-3190*.

2006

A. Hoehn, J.B. Freeman, P. Koenig, L.S. Stodieck, M. Vellone, S. Williams, J. deLuis, W. Feenstra, J.C. Parrish, S. Pretorius, L. Sun, S. Dyble, N. Searby, D. Vandendriesche (2006): "Single Loop for Cell Culture (SLCC) – Development and Spaceflight Qualification of a Perfusion Cell Culture System." *SAE-paper 2006-01-2212*.

2005

A. Hoehn, J.M. Clawson, C. Higgins, J. Jairala, P. Journey-Kahler, J. Lee, L. Stodieck (2005): "Carbon Dioxide Scrubbers for Controlling the Gaseous Composition of Spaceflight Plant Growth Chambers – Design Trades and Test Results." *SAE-paper 2005-01-2954*.

A. Hoehn, J.M. Clawson, J.B. Freeman, L.S. Stodieck (2005): "Temperature and Humidity Control Capabilities and Limitations of a Spaceflight Plant Growth Chamber." *SAE-paper 2005-01-2845*.

J.M. Clawson and A. Hoehn (2005): "Stress-Accelerated Photodegradation of Space-Rated Flexible Transparent Films Exposed to Mars Surface UV." *SAE-paper 2005-01-2775*.

J.M. Clawson and A. Hoehn (2005): "Global Estimates of the Photosynthetically Active Radiation at the Mars Surface." *SAE-paper 2005-01-2813*.

J.M. Clawson A. Hoehn and R.M. Wheeler (2005): "Inflatable Transparent Structures for Mars Greenhouse Applications." *SAE-paper 2005-01-2846*.

2004

A. Hoehn, D.M. Klaus, L.S. Stodieck (2004) "A Modular Suite of Hardware Enabling Space Flight Cell Culture Research." *Journal of Gravitational Physiology*, Vol. 11(1), pp. 39-50.

H.D. Seelig, D. Klaus, L.S. Stodieck, A. Hoehn (2004) "Non-contact Measurement Methods of Detecting Plant Water Stress for Space Flight Growth Chamber Application." *SAE paper 2004-01-2455*.

A.G. Heyenga, L.S. Stodieck, A. Hoehn, M. Kliss, C. Blackford (2004) "Approaches in the Design of a Space Plant Cultivation Facility for *Arabidopsis Thaliana*." *SAE-paper 2004-01-2459*.

2003

A. Hoehn, J. Clawson, T. Geissinger, W. Kalinowski, J. Pineau, P. Scovazzo (2003): "Design, Testing and Operation of Porous Media for Dehumidification and Nutrient Delivery in Microgravity Plant Growth Systems." *SAE-paper 2003-01-2614*.

A. Hoehn, M. Sampson, H. Seelig, L. Stodieck, A.G. Heyenga (2003): "Spaceflight Plant Science Integration, Testing and Functional / Compatibility Verification." *SAE-paper 2003-01-2480*.

A. Hoehn, J. Clawson, J. Freeman, J. Genova, K. Gifford, L. Stodieck (2003): "Thermal Design of a Spaceflight Plant Chamber Payload." *SAE-paper 2003-01-2583*.

J. Clawson, A. Hoehn, K. Maute (2003): "Materials for Transparent Inflatable Greenhouses." *SAE-paper 2003-01-2326*.

S. Woodard, C. Goulart, M. Rupert, A. Hoehn (2003): "Performance of the STARS Life Science Payload." *SAE-paper 2003-01-2530*.

2002

Simmons, D., Benoit, M., Freeman, J., Genova, J and Hoehn, A. (2002): "Designing Fluid Handling Systems for Space Life Science Experimentation." *SAE-paper No. 2002-01-2281*.

Goulart, C., Rupert, M., Woodard, S., Hoehn, A. (2002): "Habitat Development in Support of Small Scale Biological & Biochemical Space Experiments." *SAE-paper 2002-01-2282*.

2001

Scovazzo, P., Illangasekare, T.H., Hoehn, A., and Todd, P. (2001): "Modeling of Two-phase Flow in Membranes and Porous Media in Microgravity as Applied to Plant Irrigation in Space." *Water Resources Res.* Vol. 37(5): pp. 1231-1243.

Stodieck, L., Hoehn, A., and Klaus, D. (2001): "Commercial Space Life Sciences Research: Opportunities and Challenges on the International Space Station." In: Proceedings of the AIAA Conference on ISS Utilization, *AIAA-2001-4911*.

2000

Clawson, J.M., Hoehn, A., Stodieck, L.S., Todd, P., and Stoner, R.J. (2000): "Re-examining Aeroponics for Spaceflight Plant Growth." *SAE-paper 2000-01-2507*.

Clawson, J.M., Hoehn, A., Stodieck, L., Todd, P. and Cadogan, D. (2000): "Optimizing the Structural Subsystem of the AG-Pod Crop Production Unit." *SAE-paper 2000-01-2477*.

Heyenga, A.G. Forsman, A. Stodieck, L.S., Hoehn, A. and Kliss, M. (2000) "Approaches in the Determination of Plant Nutrient Uptake and Distribution in Space Flight Conditions." *Advances in Space Research*, 26(2): pp. 299-302.

Heyenga A.G., Hoehn, A., Stodieck, L. and Kliss, M. (2000): "The Design of a Mechanized Seed Sowing System for Space Flight Application." *SAE-paper 2000-01-2506*.

Hoehn A., Stodieck, L. Clawson, J., Robinson, E., Seelig, H., Heyenga, A.G., and Kliss, M. (2000): "Atmosphere Control of Spaceflight Plant Growth Chambers." *SAE-paper 2000-01-2232*.

Hoehn, A., Scovazzo, P., Stodieck, L., Clawson, J., Kalinowski, W., Rakow, A. Simmons, D., Heyenga, A.G. and Kliss, M. (2000): "Microgravity Root Zone Hydration Systems." *SAE-paper 2000-01-2510*.

Kliss, M., Heyenga, A.G., Hoehn, A. and Stodieck, L.S. (2000) "Recent Advances in Technologies Required for a Salad Machine." *Advances in Space Research*, Vol. 26(2): pp. 263-269.

Kliss, M., Heyenga, A.G., Hoehn, A., and Stodieck, L.S. (2000): "Towards the Development of a Salad Machine." *SAE-paper 2000-01-2476*.

Scovazzo, P., Todd, P., Hoehn, A. (2000): "Membrane Porosity and Hydrophilic Membrane-Based Dehumidification Performance," *Journal of Membrane Science*, Vol. 167, pp.217-225.

Wells, B., Hoehn, A. and Levine, H. (2000) "Collaborative Development of a Spaceflight Experiment Comparing Two Plant Nutrient Delivery Systems." *SAE-paper 2000-01-2509*.

Wessling, F.C., Stodieck, L.S., Hoehn, A., Woodard, S., and Thomas, S. (2000) "Low Temperature, Low Energy Carrier (LoTec) and Phase Change Materials (PCMS) for Biological Samples". *SAE-paper 2000-01-2506*.

1999

Hoehn, A., Clawson, J.M., Heyenga, A.G., Scovazzo, P., Sterrett, K.S., Stodieck, L.S., Todd, P., and Kliss, M.H. (1999) Mass transport in a spaceflight plant growth chamber. *SAE 1998 Transactions / J. of Aerospace*. 107(1). Also: Society of Automotive Engineers Technical Paper Series, No. 1998-1553.

Hoehn, A., Freeman, J.B., and Stodieck, L.S. (1999). "Incubator Designs for Space Flight Application - Optimization and Automation". *SAE paper 1999-01-2177*.

Clawson, J.M., Hoehn, A., and Stodieck, L.S. (1999). "AG Pod - The Integration of Existing Technologies for Efficient, Affordable, Space Flight Agriculture". *SAE paper 1999-01-2176*.

1998

Hoehn, A., Clawson, J.M., Heyenga, A.G., Scovazzo, P., Sterrett, K.S., Stodieck, L.S., Todd, P., and Kliss, M.H. (1998): "Mass transport in a spaceflight plant growth chamber." *SAE paper 98-1553*.

Scovazzo, P., Burgos, J., Hoehn, A., and Todd, P. (1998): "Hydrophilic membrane-based humidity control." *J. Membrane Sci.*, Oct 14, 1998, 149(1): 69-81.

Stodieck, L.S., A. Hoehn and A.G. Heyenga, (1998): "Space Flight Research Leading to the Development of Enhanced Plant Products: Results from STS-94." In: *Space Technology and Applications International Forum (STAIF-98); Proceedings of the 2nd Conference on Applications of Thermophysics in Microgravity and 3rd Conference on Commercial Development of Space*, Albuquerque, NM, Jan. 25-29, 1998. Pt. 2 (A98-21318 04-12), Woodbury, NY, American Institute of Physics (AIP Conference Proceedings, No. 420), 1998, p. 578-585. Publisher: American Institute of Physics (AIP Conference Proceedings, No. 420), Woodbury, NY. Contract: NAGW-1197.

Morgenthaler, George W; Boston, P; Hoehn, A; Horner, M; McMillen, K; Meyer, T; Stodieck, L (1998): "BioTox: A Biologically-based Soil Toxicity Instrument." In: *Proc. Int. Conf. Expos. Eng. Construct. Opr. Space*, ASCE, Reston, VA, (USA), 1998, pp. 22-28. The 1998 6th International Conference and Exposition on Engineering Construction, and Operations in Space, Albuquerque, NM, USA, 04/26-30/98.

1997

Hoehn, A., Forsman, A., Forsyth, S.W., Gifford, K.K., Heyenga, A.G., Sterrett, K.S., Scovazzo, P., and Stodieck, L. (1997): "Plant Life Support During 16 Days in Microgravity." Annual Meeting, American Society of Gravitational and Space Biology. *ASGSB Bulletin*, vol.11 (1), Nov. 1997.

M.B. Horner, D.S. Hanna, H. Ashraf, and A. Hoehn (1997): "Optimizing and Integrating Thermal Control Systems for Space Life Sciences Hardware." *SAE paper 97-2543*,

Hoehn, A., D.J. Chamberlain, S.W. Forsyth, D.S. Hanna, G. Heyenga, M.B. Horner, M.H. Kliss, P. Scovazzo, L.S. Stodieck, P.W. Todd (1997): "On-orbit and Ground Performance of the PGBA Plant Growth Facility." *SAE paper 97-2366*.

Hoehn, A., D.J. Chamberlain, S.W. Forsyth, D.S. Hanna, M.B. Horner, P. Scovazzo, J.D. Smith, L.S. Stodieck, P. Todd, A.G. Heyenga, M.H. Kliss, R. Bula and R. Yetka (1997): "10 Day Flight Performance of the Plant Generic BioProcessing Apparatus (PGBA) Plant Growth Facility Aboard STS-77." In: *Proceedings, Space Technology & Applications International Forum (STAIF-97) - Conference on Applications of Thermophysics in Microgravity, 1st and Conference on Commercial Development of Space*, 2nd, Albuquerque, NM, Jan. 26-30, 1997, Proceedings. Pt. 2 (A97-26032 06-12), Woodbury, NY, AIP Press (AIP Conference Proceedings, No. 387), 1997, p. 1005-1010.

Scovazzo, P., P. Todd, J. Burgos, N. Lattarulo and A. Hoehn. (1997): "Membrane-based Humidity Control in Microgravity: A Comparison of Membrane Materials and Design Equations." *SAE-paper 97-2275*.

1996

Heyenga, A.G., A. Hoehn, D.J. Chamberlain, J.D. Smith, M.H. Kliss, P.W. Todd, and L.S. Stodieck (1996): "Growth and Development of Plants in the Plant Generic BioProcessing Apparatus on Shuttle Flight STS-77." Annual Meeting, American Society of Gravitational and Space Biology. In: *Gravitational and Space Biology Bulletin*, Vol. 10(1), p. 34.

1995

Adams, W.W. III; Hoehn, A.; Demmig-Adams, B. (1995): "Chilling Temperatures and the Xanthophyll Cycle. A Comparison of Warm-grown and Overwintering Spinach." *Australian Journal of Plant Physiology*. Vol. 22(1), pp. 75-85.

Fleet, M.L., Simske, S.J., Hoehn, A., Schmeister T.A., Luttges M.W. (1995): "An Autonomous Module for Supporting Mice During Spaceflight." *Microgravity Sci Technol.*, 1995 May, Vol.8(1), pp. 62-67.

1994

Abts, K. J., Dittmer, L. N., Hoehn, A. and Luttges, M. W. (1994): "Stress-Produced Ethylene Effects on Alfalfa, Clover, and Lettuce Seedlings Grown for One and Two Weeks in Microgravity." 10th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, October 20-23, 1993. *ASGSB Bulletin* Vol. 8(1): p. 15.

Hoehn, A., Luttges, M. W. and Stodieck, L. S. (1994): "Plant-Module for Autonomous Space Support (P-MASS)." *Advances in Space Research*, Vol. 14(11), pp. 53-60.

Hoehn, A., Kliss, M. H., Luttges, M. W., Robinson, M. C. and Stodieck, L. S. (1994): "P-MASS and P-GBA: Two New Hardware Designs for Growing Plants in Space." *SAE-paper 94-1545*.

Hoehn, A., Luttges, M. W. and Stodieck, L. S. (1994): "Seed Germination and Early Plant Morphology- Results from Three Microgravity Missions." *SAE-paper 94-1545*.

1993

Faller, M. K., Hoehn, A. and Luttges, M. W. (1993): "The Effect of Various Light Sources and Intensities on Chlorella Growth Rates." 9th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, October 20-23, 1993. *ASGSB Bulletin*, Vol. 7(1): p. 66.

Hoehn, A. (1993): "Effects of Gravity and Light on Plant Growth and Performance in Normal and Reduced Gravity." Doctoral Thesis, University of Colorado, Boulder.

Hoehn, A. and Luttges, M. W. (1993): "Seed Germination and Early Plant Development of Alfalfa, Clover and Lettuce Seeds in Space." 9th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, October 20-23, 1993. *ASGSB Bulletin* Vol. 7(1), p. 66.

Shah S, Faller WE, Hoehn A, Birdsong M, Luttges MW. (1993): "Characterization of Fluid Distribution Through a Porous Substrate under Dynamic g Conditions." *Biomed Sci Instrum.*, 1993, Vol. 29, pp.401-408.

1992

Faller, M. K., Abrahamson, K. S., Hoehn, A. and Luttges, M. W. (1992): "The Competing Effects of Light versus Gravity Stimulation on Growth Orientation of Lettuce, Alfalfa, and Clover." 8th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, October 24-27, 1992. *ASGSB Bulletin*, Vol. 6(1), p. 38.

Hoehn, H. K.S. Abrahamson, S. Gomez, M. Voorhees, and M.W. Luttges (1992): "Seed Germination and Early Plant Development onboard STS-50 / USML-1." *ASGSB Bulletin*, Vol. 6(1), p. 38.

Hoehn, A., Gomez, S. and Luttges, M. W. (1992): "The Lunar CELSS Test Module." *AIAA paper 92-1094*,

Hoehn, A., Luttges, M. W., Stodieck, L. S. and Kliss, M. H. (1992): "Design and Evaluation of a Payload to Support Plant Growth Onboard COMET 1." *SAE-paper 92-1389*.

Hoehn, A., Simske, S. J. and Luttges, M. W. (1992): "P-MASS - The Plant-Module for Autonomous Space Support Onboard COMET 1." Proceedings, International Conference on Life Support and Biospherics, February 18-20, 1992, pp. 579-588.

Luttges, M. W., Stodieck, L. S. and Hoehn, A. (1992): "Plant Module for Autonomous Space Support." *World Space Congress - Book of Abstracts*, Session F4.1-M1.09, p. 593.

Shah, S., Hoehn, A., Faller, W. E., Birdsong, M. and Luttges, M. W. (1992): "A Plant Nutrient Monitoring System (PNMS)." 8th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, October 24-27, 1992. *ASGSB Bulletin*, Vol. 6(1), p. 36.

Simske, S. J. Luttges, M. W., and Hoehn, A. (1992): "The A-MASS - The Animal-Module for Autonomous Space Support Onboard COMET 1." Proceedings, International Conference on Life Support and Biospherics, February 18-20, 1992. pp. 589-598.

1991

Dittmer, Laura N., Drews, Michael E., Lineaweaver, Sean K., Shipley, Derek E., Hoehn, Alexander (1991): "A Lunar Base Reference Mission for the Phased Implementation of Bioregenerative Life Support System Components." [Final Report]. NASA-CR-189973; NAS 1.26:189973. Contract: NASW-4435.

Faller, M. K., Hoehn, A. and Luttges, M. W. (1991): "Light Emitting Diodes as an Alternative Light Source for Algal Systems." 7th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, October 17-20, 1991. *ASGSB Bulletin*, Vol. 5(1), p. 60.

1990

Luttges, Marvin W., Johnson, A. Steve, Faller, William E., Hoehn, Alex (1990): "A Robotic Return to the Moon." In: Engineering, construction, and operations in space II; Proceedings of Space 90, the Second International Conference, Albuquerque, NM, Apr. 22-26, 1990. Vol. 2 (A91-27576 10-12). New York, American Society of Civil Engineers, 1990, p. 1015-1024.

Hoehn, A. and Luttges, M. W. (1990): "The CU Salad Machine: Key Technologies for Plant Production in Space." 6th Annual Meeting, American Society of Gravitational and Space Biology, ASGSB, November 2-5, 1990. *ASGSB Bulletin* 4(1), p. 69.

Hoehn, A. and Luttges, M. W. (1990): "Tuning the Efficiencies of Plant Lighting Systems - From Primary Energy to Edible Biomass: The LED as an Alternative Light Source." Proceedings, 4th European Symposium Life Sciences Research in Space, *ESA-SP-307*, pp. 449-454.

1987 - 1989

Faller, W; Hoehn, A; Johnson, S; Moos, P; Wiltberger, N (1989): "CIS-lunar Space Infrastructure Lunar Technologies: Executive summary." [Final Report]. NASA-CR-186220; NAS 1.26:186220. Contract: NASW-4435.

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Hoehn, A. (1988): "Friction Factor Correlation with Special Respect to Heat Transfer and Supercritical Fluids." ESA-ESTEC working paper: E.W.P. No. 1520, ESTEC-YPC, July 1988.

Hoehn, A. (1987): "Comparison Between Different Penetration Formulae for Single and Double Wall Designs." ESA-ESTEC internal paper: YME/AH/0247, October 1987.

Hoehn, A. (1987): "Theoretical and Experimental Investigations for a Two-Stage Accelerator." Thesis for German "Diplom-Ingenieur". Based on work at the Hypervelocity Accelerator Facility for space debris and meteorite impact simulation at the Technical University of Munich, June 1987.