

7. REFERENCES and SUBJECT INDEX

7.1 List of References

- 1 D.E.KOELLE: Statistisch-analytische Kostenmodelle für die Entwicklung und Fertigung von Raumfahrtgerät, Dissertation an der Technischen Universität München, Juli 1971. Published in the Journal RAUMFAHRTFORSCHUNG, Vol.15, No.5/71 (Part 1) and in No.1/72 (Part 2).
- 2 M.C.HEUSTON, J.G.FISH and E.C.BRADLEY (Aerospace Corp.): Accuracy of Launch Vehicle Cost Analysis, SAE Space Technology Conference Proc., May 1967
- 3 D.E.KOELLE and H.H.KOELLE: Future Low-Cost Space Transportation System Analysis, ACTA ASTRONAUTICA, Vol.6 (1979), pp.1635-1667
- 4 D.E.KOELLE (MBB) : Performance and Cost Analysis of an SSTO plus OTV as a Heavy Cargo Transportation System to Geosynchronous Orbit, IAF-Paper 78-A-27. Internatl. Astronautical Congress, Dubrovnik/Yugoslavia, Oct.1978
- 5 E.W.BONETT (McDonnell-Douglas): A Cost History of the THOR-DELTA Launch Vehicle Family, IAF Congress Amsterdam, Oct.1974
- 6 G.H.FISCHER (Rand Corp.) : A Discussion of Uncertainty in Cost Analysis, Rand Corp.Report, April 1962
- 7 R.H.NANSEN and H.DiRAMIO (Boeing Co.): Heavy Lift Freighters - A Transportation System of the Future, AIAA-Paper 78-316 (1978)
- 8 P.D.CASTENHOLZ (Rocketdyne): The Space Shuttle Engine, Paper at the 24th IAF Congress, Baku/ Azerbeidschan, Oct.1973
- 9 R.R.ATHERTON and M.PIKE (Pratt & Whitney) : Rocket Engine Cost and Reliability Considerations for Reusable Launch Vehicles, Report No.PWA-FR- 1191, Nov.1964
- 10 D.E.KOELLE (MBB): The TRANSCOST Model and its Application to Future Systems Analysis (ARIANE 5), Paper IAA-82-226, 33rd Internatl.Astronautical Congress, Paris, Sep.1982
- 11 BOEING Report No. D180-19845-3, 1976
- 12 M.C.HEUSTON, J.G.FISH and E.C.BRADLEY (Aerospace Corp.): Accuracy of Launch Vehicle Cost Analysis, Proceedings, SAE Space Technology Conference, Palo Alto, CA, May 1967
- 13 D.J.SHRAMO (NASA LRC) and B.R.FOUSHEE, P.J.LEARY (GD-Convair) : CENTAUR, A Major Element of the Current Space Transportation System, 25th IAC, Amsterdam, Oct.1974

- 14 J.B.MARSZALIK (Lockheed): Learning Curve Theory Applied to Spacecraft Production, J.Space/ Aeronautics
- 15 H.H.KOELLE et al. (T.U.Berlin): NEPTUNR-2000 Plus, Concept of a Heavy Space Freighter for the 21st Century, Aerospace Institute, Technical University Berlin, Report / Mitt.229/1989
- 16 D.E.KOELLE (MBB): SPS Transportation Requirements - Economical and Technical, Space Solar Power Review, Vo.2, pp.33-42, 1981
- 17 D.E.KOELLE (MBB): The Impact of Launch Vehicle Type and Size on Development Cost, Acta Astronautica, Vol.8 (1981), No.11/12, pp.1192-1205
- 18 MBB-Study for ESA: Future Space Transportation Systems for Europe“, Report URV-119(80), Oct.1980
- 19 R.LOHMÜLLER (Linde AG): Entwicklungen und Tendenzen in der Wasserstoffherstellung, Chem.Ing.Tech. 56(1984), Nr.3 (Hydrogen Production from Hydrocarbons)
- 20 LUFTHANSA-Jahrbuch 1986
- 21 J.E.LOVE and W.R.YOUNG (NASA): Operational Experience of the X-15 Airplane as a Reusable Vehicle System, SAE Space Technology Proceedings, Palo Alto, CA, May 1967
- 22 NASA Report to the Congress, 1985
- 23 G.R.WOODCOCK (Boeing): SPS System Definition Study, Space Transportation Analysis, Final Report Phase III, June 1980, Report No.D 180-25969-5
- 24 W.R.RICE (NASA-MSFC): Economics of the Solid Rocket Boosters for the Space Shuttle, Paper 78-A-24 at the IAF-Congress 1978
- 25 E.B.DEAN (NASA LaRC) et al.: Cost Risk Analysis Based on Perception of the Engineering Process, 8th Annual ISPA Conference, Kansas, Miss. May 1986
- 26 J.E.A. HARRISON: Some Cost Estimation Problems Associated with International Collaboration - an Idiosyncratic View, ISPA Conference Brighton/ UK, Aug.1988
- 27 J.W. HAMAKER (NASA MSFC): NASA-MSFC's Engineering Cost Model (ECM), Paper at the ISPA Conference Brighton, UK, Aug.1988
- 28 SPACE SHUTTLE DIRECTIONS, NASA Johnson Space Flight Center, Doc.No.JSC-20939, April 1986
- 29 D.E.KOELLE and H.KUCZERA (MBB): SÄNGER Space Transportation System - Progress Report 1990, Paper IAF-90-175, 41th Intern.Astronautical Congress, Dresden/ Germany

- 30 OTA (Office of Technology Assessment, Washington) : Reducing Launch Operations Cost - New Technologies and Practices", OTA-TM-ISC-28, Sept.1988
- 31 R.C.PARKINSON (BAe): A Total System Approach Towards the Design of Future Cost-Effective Launch Systems, IAA Symposium on Space Systems Cost Estimation, San Diego, CA, May 1990
- 32 D.P.MASERANG (GD): Balancing Launch Systems Reliability and Life-Cycle Cost, IAA Symposium on Space Systems Cost Estimation, San Diego, CA., May 1990
- 33 D.E.KOELLE: The Man-Year (MYr) as Parametric Cost Unit for International Cost Models, 12th Annual ISPA Conference, San Diego, CA, May 1990
- 34 S.A.GREENBERG (USAF) and R.B.NICOL (Martin-Marietta): Application of Computer Simulation to Life-Cycle Management to Minimize Space Transportation Cost (ALSYM), Paper IAA-89-698, IAF Congress Malaga, Spain, Oct.1989
- 35 R.C.PARKINSON (BAe): Parametric Cost Modelling of Aerospace Structures, Sept.1990
- 36 S. PACE: Space Transportation Cost: Reliability and Resiliency, Paper IAF-89-699, IAF Congress Malaga, Spain, Oct.1989
- 37 G.STINE and P.HANS: Economic Considerations on Hypersonic Vehicles and Spaceplanes, AIAA Preprint 90-5267, Oct.1990
- 38 A.J. McDONALD (Thiokol): Solid Propulsion System Reliability", AIAA/SAE/ASME/ASEE Joint Propulsion Conference, Orlando, FL, June 1990
- 39 R.C.PARKINSON (BAe): Parametric Cost Engineering Design Demonstration: Cost Analysis of Engine Trade-offs, BAe Report, Nov.1988
- 40 C.J. MEISL: Life-Cycle Cost Methodology for Space Rocket Engines, 13th ISPA Annual Conference, May 1991
- 41 R.C.PARKINSON (BAe): Organizational Impediments to the Reduction of Costs of Space Programmes, Paper IAA-91-639, 42nd IAF Congress, Oct.1991, Montreal, CAN.
- 42 A.W.NEASE, R.M.THIEL, K.C.SMITH (Rockwell): An Approach to Shuttle Evolution, 28th Space Congress, Cocoa Beach, FL, April 1991
- 43 D.E.KOELLE (MBB): Launch Cost Reduction - How to Realize ?, First Krafft A.Ehricke Memorial Lecture, 42nd IAF Congress, Montreal, Canada, Oct.1991
- 44 C.L.WHITEHAIR et al. (Aerospace Corp.): Operational Design Factors for Advanced Space Transportation Vehicles, Paper IAF-92-0879, Oct.1992, Washington, D.C.

- 45 A.TOTEN, J.FONG and R. MURPHY (General Dynamics): NASP-Derived Vehicle Launch Operations Cost and Program Cost Recovery Options, 3rd Intern. Aerospace Planes Conference, Dec.1991, Orlando, FL
- 46 T.A.TALAY , D.C.FREEMAN (NASA Langley) and A.A.MOORE (Lockheed): „Business as Usual“ vs.“Skunk Works“ Comparison - Study Results for Development of the HL-20 Lifting Body Spacecraft , 44th IAF Congress, Graz/Austria, Oct.1993, Paper No.IAF 93-V.3.618
- 47 Rockwell Cites Spare Parts Progress, Space News, Nov.13, 1989
- 48 S.P.WORDEN and J.M.SPONABLE: Management on the Fast Track, Aerospace America, Nov.1994
- 49 B.K.THOMAS: X-15 Flights Provide Baseline Data on Reusable Space Vehicles, Aviation Week, 9th Jan.1967
- 50 W.BERRY (ESTEC): Future Launchers: The Challenge of Reusability, Dec.1994
- 51 W.A.GAUBATZ (McDonnell Douglas) , J.SPONABLE (BMDO): Delta-Clipper - Developing and Testing the Next Generation Space Transportation System, 19th ISTS, Yokohama, Japan, May 1994
- 52 M.J.MCCULLEY and J.F.MADEWELL (Lockheed): AIAA Space Programs and Technology Conference, Huntsville, AL, Sept.1993 - Preprint No.93-4056
- 53 S.J.HOESER : Technology Readiness Review of the Spaceship Experimental (SSX), The Journal of Practical Applications in Space, 1986
- 54 T.P.SAPP (Douglas): Economics of Booster Recovery, Douglas Engineering Paper No.1652, Sept.1963
- 55 D.E.KOELLE (DASA): Launch Cost Assessment of Operational Winged Launch Vehicles, 4th Intern.Aerospace Planes Conference, Orlando, FL, Dec.1992, Preprint AIAA-92-5021
- 56 Commercial Space Transportation Study (CSTS) - Boeing, Lockheed-Martin, McDonnell Douglas, Rockwell, April 1994
- 57 J.S.GREENBERG and R.STEEN (Princeton Synergetics): The Space Insurance Industry: Does it have a Future ?, Aerospace America, Jan.1994
- 58 R.A. HICKMAN et al. (Aerospace Corp.): Developing Operable Launch Systems: New Methods and Tools, Paper IAF-94-553, 45th IAF Congress, Oct.1994, Jerusalem
- 59 I. BEKEY (NASA Hq.): A Win-Win Concept for Commercial Development and Operation of a New Large Reusable Space Launch Vehicle , White Paper, 19 p., Dec.1994
- 60 P. COLLINS, T.ASHFORD: Potential Implications of the Development of Space Tourism“, IAF Congress 1986, Innsbruck, Austria

- 61 AVIATION WEEK and Space Technology, Feb.20, 1995
- 62 D.E.KOELLE (TCS) : Cost Model Applications for Optimized Launch Vehicle Design, Workshop on Space Launch Systems Cost, Risk Reduction and Economics, Munich, 1994
- 63 D.E.KOELLE (TCS): Cost-Optimized Stage Separation Velocity of Winged TSTO Launch Vehicles, Paper IAA-94-1.1.582, 45th Intern.Astronautical Congress, Jerusalem, Oct.1994
- 64 K.HEISS et al.: Economic Analysis of New Transportation Systems, Mathematica, Inc.,Princeton, May 1971
- 65 H.H.KOELLE and B. JOHENNING: A Multi-Vehicle Space Carrier Fleet Cost Model (Lunar Transportation), ILR-Mitteilung 240 (1990), Techn.University Berlin, May 1990
- 66 NASA-MSFC Press Release 69-70 (March 19969)
- 67 J.S.NIEROSKI and E.I. FRIEDLAND (Aerospace Corp.) : Liquid Rocket Engine (Production) Cost Estimating Relationships, AIAA-Paper 65-533, July 1965
- 68 R.L.SACKHEIM and P.DERGARABEDIAN (TRW): Potential Cost Reduction by Ultra-Low Cost Expendable Launch Vehicle Technology, IAF-Congress Oslo, Oct.1995
- 69 J.W.SMELSER (NASA-MSFC) and M.T. CONSTANTIN (Industrial Project Director) : STME, Streamlining the Engine of Change, Aerospace America, July 1992
- 70 V.RACHUK et al. : Evolution of the RD-120 Engine for Future Launch Systems. Paper AIAA 96-3004, 32nd Joint Propulsion Conference, Buena Vista, CA, July 1996
- 71 S.DUTTA, D.L.BLOCK, R.L. PORT: Economic Assessment of Advanced Electrolytic Hydrogen Production, Intern.Journal for Hydrogen Energy, Vol.15 (1990), No.6, pp.387-395, Pergamon Press
- 72 J.P.PENN and C.A.LINDLEY (The Aerospace Corp) : Requirements and Approach for a Space Tourism Launch System, Paper IAA-97-IAA 1.2.08, 48th IAF Congress, Torino, IT, Oct.97
- 73 D.E.KOELLE: Cost Engineering - The New Paradigm for Launch Vehicle Design, Paper IAA-97-IAA 1.1.04, 48th IAF Congress, Torino, IT, Oct.97
- 74 D.E. KOELLE: Requirements for a Space Tourism-dedicated Launch Vehicle, Paper IAA-97-IAA 1.2.05, 48th IAF Congress, Torino, IT, Oct.97
- 75 D. MANSKI et al. : Overview of Engine Cycles for Earth-to-Orbit Propulsion, 3rd Intl. Symposium on Space Propulsion, Aug.1997, Beijing, China
- 76 Z. HUANG : Normalization of Launch Vehicle Cost Estimation Methodology, Paper IAA-97-IAA 1.1.03, 48th IAF Congress, Torino, IT, Oct.97

- 77 W.GAUBATZ et al. : Summary Report on the DELTA CLIPPER Experimental Flight Demonstration Program, Paper IAF-97-V.3.08, 48th IAF Congress, Torino, IT, Oct.97
- 78 D.E.KOELLE and W.KLEINAU : Assessment of Reusable Launch Vehicles' Development Cost, TCS-Report TN-150, 45 pages, Feb.1997
- 79 D.E.KOELLE : The International Standardized „Cost-per-Flight“ Definition for Launch Vehicles, Paper IAF-98-IAA.1.2.05, 49th Internatl.Astronautical Congres, Melbourne, Australia, Sep.1998
- 80 H.M.SANDERS and D.E.KOELLE : Cost-Optimum Launcher Design by Cost and Performance Normalization, Paper at the 49th Internatl. Astronautical Congres, Melbourne, Australia, Sep.1998
- 81 A. NEASE (Boeing) : Space Shuttle - Reducing the Cost of Safe, Reliable Space Transportation, Paper IAF-98-V.1.09 at the 49th Internatl. Astronautical Congres, Melbourne, Australia, Sep.1998
- 82 E. SHAW et al. (NASA-MSFC) : Benefits of Government Incentives for Reusable Launch Vehicle Development, 49th Internatl. Astronautical Congres, Melbourne, Australia, Sep.1998
- 83 D.E. KOELLE : A Cost-Engineered Launch Vehicle for Space Tourism, Paper IAF-98-IAA1.5.07 at the 49th Internatl. Astronautical Congres, Melbourne, Australia, Sep.1998
- 84 R.C.PARKINSON (MMS): The Hidden Cost of Reliability and Failure in Launch Systems. Paper IAA-98-IAA.1.2.04, 49th Internatl.Astronautical Congress, Melbourne, Austr., Sep.1998
- 85 C.L.WHITEHAIR, R.A.HICKMAN et.al. (Aerospace Corp.): Operational Design Factors for Advanced Space Transportation Vehicles, Paper IAF-92-0879, 43rd IAF Congress, Aug./Sep.92, Washington, D.C., USA
- 86 L.J.JUNKER (NASA-KSC) : Ocean Recovery of Shuttle Solid Rocket Boosters, AIAA/ASME/SAE Joint Space Mission Planning and Execution Meeting, Denver, CO, July 1973, Paper AIAA 73-602
- 87 S.J. ISAKOWITZ et al.: International Reference Guide to Space Launch Systems, 3nd.Ed. (1999) AIAA Reston, VA /USA, 550 pages.
- 88 T.FANCIULLO and D.JUDD (Aerojet): Evolution of the RD-0120 and its Design Variants for Use on Reusable Launch Vehicles. Paper IAF-99-S.2.01, 50th Internatl.Astronautical Congress, Amsterdam/NL, Oct.1999
- 89 ROCKETDYNE: Operationally Efficient Propulsion System Study Data Book, NAS10-11568, April 1990
- 90 H.GRALLERT and H.KUCZERA (Dasa): Kick Stages - A Mandatory Element of Future RLVs, Paper AIAA99-4885, 9th AIAA International Space Planes and Hypersonics Conference, Norfolk, VA, Nov.1999

- 91 H.L.WEINREICH and H:GRALLERT (Dasa) , R.PARKINSON (BAe) and W.BERRY (ESTEC): Studies on a Scramjet-propelled HTOL-SSTO Launcher, 5th AIAA/DGLR International Aerospace Planes and Hypersonics Conference, Nov./Dec.93, Munich/ Germany
- 92 E.D.HARRIS (RAND Corp.): The National Aerospace Plane: Cost Considerations for the Follow-on-Vehicle, Workshop on Space Launch Systems - Cost, Risk Reduction and Economics, Munich/Germany, June 1994
- 93 I. BEKEY (NASA Hq.) : Why SSTO Rocket Launch Vehicles are now Feasible and Practical - A White Paper, Jan.1994
- 94 S.D.SCREECH (NASA-MSFC) : Cost Results of NASA's Access-to-Space Study, Workshop on Space Launch Systems - Cost, Risk Reduction and Economics, Munich/ Germany, 1994
- 95 J.D.ADAMS (Aerospace Corp.): Payload Interface Standardization, Paper IAF-95-V.5.05, 46th Internatl.Astronautical Congress, Oslo/ Norway, Oct.1995
- 96 H.APGAR (MCR) : Developing the Space Hardware Cost Model“, Paper IAA-CESO-04(90) at the IAA Symposium on Space Systems Cost Estimation Methodologies and Applications, San Diego, Ca, USA, ..May 1990
- 97 D.E.KOELLE (TCS): Economics of Fully Reusable Launch Systems - SSTO vs. TSTO Vehicles, Paper IAA-96-1.1.03, 47th Internatl.Astronautical Congress, Beijing/China, Oct.1996
- 98 ACCESS-TO-SPACE STUDY, NASA Hq., Washington, Jan.1994
- 99 R.B.NICOL (Martin Marietta): Launch System Life Cycle Costing through Process Analysis, IAA Symposium on Space Systems Cost Estimation Methodologies and Applications, San Diego, CA, May 1990
- 100 E.ZAPATA and A.TORRES (NASA KSC and Florida Gulf Coast University): Space Operations Cost Modelling and the Architectural Assessment Tool, Paper IAA-99-1.1.01, 50th Internatl. Astronautical Congress, Amsterdam / NL, Oct.1999
- 101 ESA-FESTIP (Future European Space Transportation Investigation Program), System Study, DASA - DaimlerChrysler Aerospace, Final Report , Dec.1998
- 102 D.E.KOELLE (TCS): Cost Contributing Elements of Expendable L/Vs and Means for Cost Reduction, ESTEC Low-cost Access-to-Space Study, July 1997, Report TCS-TN-152(97)
- 103 ADVANCED SPACE TRANSPORTATION SYSTEM STUDIES, Technical Area 3: Alternate Propulsion System Concepts, NAS-8-39210, DCN1-1-PP.021^47, Rocket Engine Life Analysis, Aug.1996

- 104 IAA-CESA: The International Standardized "Cost-per-Flight"- Definition for Launch vehicles, Paper IAA-98-IAA.1.2.05, 49th Internatl.Astronautical Congress, Melbourne/Australia, Sep.1998
- 105 S.ABITZSCH (TUB) : Economical Feasibility of Space Tourism - A Global Market Scenario, Paper IAA-97-IAA.1.2.01, Oct.1997, 48th Intern.Astronautical Congress Torino, Italy
- 106 D.E.KOELLE (TCS): Requirements for Space Tourism Launch Vehicles, Paper IAA-97-IAA.1.2.05, 48th Internatl. Astronautical Congress, Torino, Italy, Oct.1997
- 107 D.E.KOELLE (TCS): A Cost-Engineered Launch Vehicle for Space Tourism, Paper IAA-98-IAA-00-IAA.1.5.07 at the 49th Internatl. Astronautical Congress, Melbourne, Australia
- 108 D.E.KOELLE (TCS): The Ballistic SSTO - The Lowest-Cost Reusable Launch Vehicle, Paper IAA-00-IAA.1.1.08, 51th Internatl. Astronautical Congress, Rio de Janeiro, Brazil, Oct.2000
- 109 B. CITRON: The Economics of Starting an International Space Tourism Business, Paper at the First International Symposium on Space Tourism, Bremen, Germany, March 1997
- 110 D.E.KOELLE (TCS): Space Transportation Analysis for Future Space Research and Utilization, Report TCS-TN-163(99), prepared for DLR/ESTEC, Feb.1999
- 111 K.BOHNHOFF, H.KELLERMEIER and D.E.KOELLE (MBB): Impact of Space Tug Concepts and Space Program Economics, Journal RAUMFAHRTFORSCHUNG, Vol.17, No.3, May 1973
- 112 W.H.WILLCOCKSON (Martin Marietta): OTV Aero-Assist with Low L/D, Paper IAF-86-115 at the 37th Internatl. Astronautical Congress, Innsbruck/Austria, Oct.1986
- 113 H.H.KOELLE (TUB): Lunar Space Transportation - Cuttting the Costs of Logistics, Paper IAA-95-IAA.1.1.08, 46th Internatl. Astronautical Congress, Oslo/Norway, Oct.1995
- 114 D.G.ANDREWS (Boeing) , J.R.HODGE (Martin Marietta), C.K.FROST (NASA-MSFC): A Space Transportation System for Early Lunar Exploration, Paper IAF-92-0845, 43th Internatl. Astronautical Congress, Washington, D.C., USA, Aug./Sep.1992
- 115 B.K.JOOSTEN (NASA-JSC) AND L.A.GUERRA (SAIC) : Early Lunar Resource Utilization, a Key to Human Exploration, Paper AIAA 93-4784, Sep.1993, Huntsville, Ala. USA
- 116 W.SIEGFRIED (Boeing) : Lunar Base Development Missions, Paper MD698H1323, June 1998, 49th Internatl.Astronautical Congress, Melbourne / Australia, Sept.1998

- 117 J.R.WERTZ (Microcosm): Economical Model of Reusable vs. Expendable Launch Vehicles, Paper at the 51st Internatl.Astronautical Congress, Rio de Janeiro/Brazil, Oct. 2000
- 118 R.E.AUSTIN (NASA) and C.LACEFIELD (Lockheed Martin): X-33, Leading the Way to Venture Star in this Decade. Paper IAF-00-V.3.02, 51st Internatl. Astronautical Congress, Rio de Janeiro, Brazil, Oct.2000
- 119 A. HILL: A Cost Optimization Methodology for Sizing Reusable Launch Vehicles, Paper IAA-00-IAA.1.1.07, 51st Internatl.Astronautical Congress, Rio de Janeiro, Brazil, Oct.2000
- 120 J.PEARSON et al (BALL Aerospace): Low-cost Launch Systems for the Dual-Launch Concept Paper IAA-00-IAA.1.1.06, 51st Internatl.Astronautical Congress, Rio de Janeiro, Brazil, 2000
- 121 W.GAUBATZ et al (USL): International Rule Planning for Governing Space Transportation, Paper IISL-00-IISL.3.09, 51st Internatl.Astronautical Congress, Rio de Janeiro, Brazil, 10/2000
- 122 J.S.GREENBERG: Space Transportation Decisions: Cost vs.Price, Paper at the 52nd Internatl. Astronautical Congress, Toulouse/France, Oct.2001
- 123 H.GRALLERT and G.REINBOLD (Astrium, Germany): Optimized Liquid- Propellant Fly-back Booster Concept with ARIANE 5 Core , AIAA 10th Internatl.Space Planes and Hypersonic Systems and Technologies Conference, April 2001, Kyoto/Japan
- 124 R. PARKINSON (Astrium, UK) : How to make Money out of RLVs, Paper IAC- 01-IAA.1.1.04, 52nd Internatl. Astronautical Congress, Toulouse/France, Oct.2001
- 125 S. DROGOUL (EADS Launch Vehicles): Better, Faster, Cheaper on ARIANE Programmes, Paper IAC-01-IAA.6.1.06, 52nd Internatl. Astronautical Congress, Toulouse/France, 2001
- 126 W. GAUBATZ: Sub-Orbital Flights - A Starting Point for Space Tourism, Paper IAC-00-IAA.1.3.01, 52nd Internatl. Astronautical Congress, Toulouse/France, Oct.2001
- 127 R.C.PARKINSON (Matra Marconi Space, UK) : Cost Sensitivity as a Selection Issue for Future Economic Space Transportation Systems, Paper at the 45th Internatl. Astronautical Congress, Jerusalem, Israel, Oct. 1994
- 128 D.FEYHL, K.ECKERT, H.ZEWEN (Astrium, D): Aestus Engine Experience, 5th Internatl.Symposium on Propulsion in Space Transportation, Paris, France, May 2001
- 129 E. SÄNGER (FPS): Vorläufige Vorschläge zur Entwicklung eines Europäischen Raumflugzeuges, Teil 17 „Transportkostenvergleich zwischen aeronautischen und ballistischen Raumtransportern, Stuttgart, Dez.1962

- 130 H.G.CAMPBELL, R.E.HOVDEN (The Aerospace Corp.): Launch Vehicle Cost Model, Cost Reduction Workshop, München, June 1994
- 131 H.H.KOELLE and B.JOHENNING (TU Berlin) : Space Transportation Simulation Model TRASIM 2.0, ILR-Mitteilung 319 (1997)
- 132 B.C.RUSH, J.BRACKEN and G.P.McCORMICK (Research Analysis Corp.), J.Operations Research, March/April 1967
- 133 G.W. ELVERUM (TRW) : Scale Up to Keep Mission Costs Down", 24th Internatl. Astronautical Congress, Baku, Azerbeidschan, Oct.1973
- 134 D.E.KOELLE (TCS-TransCostSystems): Specific Space Transportation Costs to GEO - Past, Present and Future, Paper IAC-02-IAA.1.1.03 , 53rd Internatl.Astronautical Congress, Oct.2002, Houston,Tx, USA
- 135 E.SHAW (NASA-MSFC): Unique Economic Characteristics of Reusable Launch Vehicles, First AIAA-IAF Symposium on Reusable Launch Vehicles, Huntsville, AL, April 2002
- 136 R.A.GOEHLICH (TUB) et al.: Cost Estimation of the NAL Spaceplane (Modelling of a Vehicle Fleet Life-Cycle), Paper IAC-02-IAA.1.1.08, 53rd Intern.Astronautical Congress, Houston2002
- 137 MBB (Germany): Leitkonzept SÄNGER - Referenz- Datenbuch, Ausgabe 1, Rev.2, März 1993
- 138 R.M.MOORE (Spacevest): Institutional Venture Capital for the Space Industry: Providing Risk Capital for Space Companies that Provide Investor Returns, Paper IAC-02-IAA.1.2.01, 53rd Internatl. Astronautical Congress Houston, TX, Oct.2002
- 139 E.PRANDINI: „Space Insurance on Bumpy Road to Recovery“, INTERAVIA, October 2002
- 140 E.JANARDHANA et.al: The Indian Polar Satellite Launch Vehicle (PSLV) - A Low-cost Launcher for small Satellite Missions, Paper IAF-99-V.1.03, 50th IAC, Amsterdam, Oct.1999
- 141 NASA: Operational Assessment of Concepts and Technologies for Highly Reusable Space Transportation, Nov.1998
- 142 G.WOODCOCK et al. : Reusable Launch Architecture to Support Sustainable Human Exploration of the Solar System (ARTS), Paper IAA.13.1.05, IAC 2003, Bremen
- 143 H.H.KOELLE; Ranking of Parameters Influencing the Cost-Effectiveness of Reusable Heavy-lift Launch Vehicles, Report ILR-356 (2001)
- 144 NASA ESAS Final Report - Exploration Systems Architecture Study. ,
NASA Hq. Washington, D.C., Nov.2005

- 145 H.H.KOELLE and R.LO: Production of Lunar Propellants, J.BIS, Vol.50, pp.353-360, 1997
- 146 R.NAGASHIMA (NASDA): The Study of Lunar Organic Infrastructures for Propellant (LOX) Production, Paper IAF-96.Q.4.05, 47th IAC, Beijing/China, Oct.1996

7.2 Subject Index, Key Words

Aerospaceplanes	72, 257
Amortization - development	196
Amortization - production/unit cost	192
APOLLO ballistic capsule	77
ARIANE 4	120, 150, 201
ARIANE 5	46, 48, 104, 149, 197, 207, 212
ArianeSpace	179, 207
ASTRIS (3rd stage)	87, 133
ATLAS	120
BETA ballistic RLV	57, 111
Business-as-Usual (BaU)	93
CENTAUR	51
Commercial development features	94
Commercial launch services	180, 207
Comparison of launch vehicle concepts	198, 111, 141, 251, 260
Cost engineering	3, 8, 114
Cost estimation models	5
Cost risks - development	101
Cost risks - production	139
Cost risks - operations	182
CpF Definition	183 ff
CpF Spread Sheets	190, 191
Currency Conversion Table/ MYr	19
DC-X demonstrator vehicle	967/98, 150
DELTA launch vehicles	155, 210, 211, 219, 221
Development cost definitions	24, 26, 28
Development schedules	88 ff
Dry mass, propulsion system	49
Dry Mass vs. aircraft take-off mass	69
Dry Mass Comparison RLVs	106
ELDO	86,
Engine Clustering	246
Engines' mass vs. thrust	44
ET (Expendable Shuttle Tank)	121
Exchange rate history	20
F-1 Rocket Engine	129,
Failure Rates	168, 202/203, 204

Flight operations	144ff
GALILEO RPM (retro Propulsion Module)	48, 132
GEO Payload Growth	220
GEO Transportation Cost	221, 222, 248
Ground Operations	144ff
HORUS (Winged 2nd Stage)	64, 193, 256
HOTOL	62
Hydrogen cost	160
Human transportation cost	225
Infrastructure cost	176
Insurance Cost	167 ff, 204 ff
KANKOH MARU Ballistic RLV	57
Kistler K-1 RLV	95, 217
Launch cost/ prices	207, 209, 211
Launch vehicle sizing	223, 249, 260
Launch services	207
Learning Factor	118
Lerning Factor Vehicles	120
Learnung Factors, Rocket engines	130
Learning Factor Operations	158
Life Cycle Cost	228
Liquid Hydrogen	160
Lunar flight modes	232
Lunar Propellant Production	243
Lunar Transfer Vehicles / Landers	81, 233
Maintenance	154
Management rules(Lockheed)	95
Man-year (MYr) Definition	18
Mass margins	17
Monopropellant engines	127, 129
NASCOM-Model	7
NEPTUNE RLV Concept	229, 237
Net Mass Fractions, Comparison	64
Ballistic vehicles	59
Cryo stages	52
Fly-back Boosters	74
Winged orbital vehicles	65
Net Mass Solid-propellant motors	34
Net Present Value (NPV)	231
Optimum vehicle lauch mass	3
Parallel Contractors	86 ff
Payload Preparations	148
Payload Ratio	213
Phased Program Planning	2
Plug Nozzle Engine	57, 111, 247
Price-H Cost Model	6
Pricing Strategies	200

Pre-launch operations	156 ff
Production cost amortization	192
Productivity (countries)	21
Propellant Cost	160, 163
Rapid Prototyping	97
Recovery Cost	166
Refurbishment - Vehicles	169, 171, 175
Refurbishment - Rocket engines	172
Reliability - Failure Modes	202-204
- Rocket Motors	40
Return-on-Investment (ROI)	232
Reusability - Subsystems	172
- Engines	38, 172
Rocket engine components	126
Rocket engines' reliability	40
SÄNGER RLV Concept	68, 195, 254
Safety Design Factors (L/V)	58
SATURN V launch vehicle	25, 51, 140
Scramjet	72
Shuttle Operations	147, 151, 159, 194,
Solid-propellant Motors Net Mass	34
Solid Propellant Cost	161
Space Operations Center	238
SPACE SHUTTLE	18, 79, 85, 121, 147, 194
Space Tourism	225, 260
Spares (RLVs)	169
Specific Transportation Cost - LEO	210ff, 215, 250, 263
Specific Transportation Cost - ISS	216
Specific Transportation Cost - GEO	218, 248 ff
SPS-Transportation	249
SSME	41, 103, 127, 129, 173
Stage Separation (Winged Vehicles)	254
Team Experience Factor	31
Technical Quality Factor	31
Technical System Support	178
Technology Readiness Level	84
Thrust-to-weight ratio /engines	44
TransCost Features	11
TraSim Cost Model	6
Turnaround time	149 ff
Vehicle integration	149 ff
Venture Star	99, 115
X-33 Demonstrator Vehicle	100
X-34 Test Vehicle	99