BILL PURDY
PURDY ENGINEERING
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CAPABILITIES

Spacecraft systems engineering
Recognized spacecraft mechanisms expertise

EXPERIENCE

1999 – Present	Purdy Engineering, Proprietor
1986 - 1999	Naval Research Lab, Spacecraft Engineering Department

SPACECRAFT SYSTEMS ENGINEERING

I have developed extensive and diverse experience over a 30 year career contributing significant efforts on 32 different flown spacecraft for 13 separate programs. This diverse experience base ranges from class A missions for national customers to high risk quick response satellites.

I have served as the lead systems engineer for a major operational weather sensor, for a space robotics research and development effort and have been a member of the systems engineering team for several space systems.

I have filled a diverse set of positions in addition to that of systems engineer: program manager, mechanical systems lead, mechanisms subsystem manager, integration and test lead, experiment integrator, flight operations, mechanisms advisor for program offices.

This diverse set of experiences on a diverse set of missions enables my high level systems engineering roles.

RECOGNIZED EXPERTISE IN SPACECRAFT MECHANISMS

I have played a key role in 25 separate spacecraft mechanisms that have all been successful in flight, including release & deployment mechanisms, gimbals and deployable antennas.

Instructor of professional course: Space Vehicle Mechanisms, Elements of Successful Design

Assistant editor of mechanisms book: Space Vehicle Mechanisms, Elements of Successful Design.

I have worked 18 separate mechanism troubleshooting efforts with roles ranging from mechanism lead to program office advisor.

DETAILED EXPERIENCE HIGHLIGHTS

13 – 16 Government spacecraft study lead systems engineer

I served as lead systems engineer for spacecraft concept design study based on a high performance payload. My responsibilities include leading the definition of mission level and spacecraft level requirements. As lead systems engineer I lead and coordinated design of all subsystems.

09 – 13 Microwave Imager / Sounder program lead systems engineer

I served as lead systems engineer for this operational weather sensor effort. My responsibilities include setting all requirements and coordinating design between all subsystems including high performance antennas and receivers, digital electronics, mechanical systems, and ground data processing. This program is intended to provide the next generation microwave weather sensing capability. The program is presently inactive while awaiting a government decision on military weather priorities.

06 – Pres Instructor for Professional Seminar, Space Vehicle Mechanisms, Elements of Successful Design

I am the instructor of this seminar covering the entire field of spacecraft mechanisms. The seminar is a featured precursor to the Aerospace Mechanisms Symposium and is also taught to private clients. This course explores the technologies required for the successful design of all types moving mechanical assemblies in the space environment. The course addresses the following mechanism types and disciplines; Motors, bearings, lubrication, deployment systems, gimbals, slip rings, interaction with space vehicle system, test and reliability specific to mechanisms. Additional detail is available at http://www.launchspace.com/1135.html.

05 – 09 FREND Robotic Research and Development program lead systems engineer

I served as lead systems engineer for this DARPA R&D effort. My responsibilities include setting all requirements and coordinating design between all subsystems including a robotic arm, 2 different machine vision algorithms, a trajectory planner algorithm, and all mechanical and electrical subsystems. This program concluded as a successful ground based technology development. I also served as mechanisms advisor and troubleshooter for the precision 7 axis robotic arm.

05 - 06 **Wild Geese Satellite test engineer spin balance and alignments. Mechanisms troubleshooter.**

I lead spin balance and alignment test efforts for this program. I was frequently tasked to be a problem solver for other subsystems because of my diverse experience providing rapid solutions for two mechanisms and one sensor problem.

03 - 06 **AEHF Gimbal calibration system**

I designed and fabricated a calibration system for a dual axis gimbal for the AEHF Gimbal Drive Assemblies. I prepared and executed the calibration data geometric analysis. This calibration tool provided .005° accuracy calibration over a temperature range from 0°C to 50°C

99 –pres. **Windsat Mechanical and Antenna Systems Lead Engineer**

I presently serve as systems engineer for the Windsat payload. The Windsat payload is an advanced polarimetric radiometer that enabled wind direction measurements from space using passive microwave measurements. My primary responsibilities are to lead the systems engineering for the antenna and for the mechanical systems. In this role I had the responsibility for preparing the overall system integration and test plan. In addition to the systems engineering, I am the lead engineer for the payload alignments and for the payload release mechanisms. I am continuing these systems engineering roles in the flight operations. This mission has been flying successfully since 2003.

97 – 99. **Windsat Mechanical Systems Lead Engineer**

I served as the mechanical systems lead for the Windsat payload. My responsibilities were to oversee all mechanical systems engineering efforts and play a strong role in the overall systems engineering and project management.

94 - 07. **Tether Physics & Survivability Experiment (TiPS) Program Manager**

I served as program manager for the TiPS program that has resulted in the longest lived space tether (>10 years) as well as significant findings regarding tether dynamics. The program went from a blank sheet of paper to qualified flight hardware in 15 months. I also served as mechanical systems lead, and integration and test manager on this project.

91 - 98 Advanced Release Technologies (ARTS) program manager.

I initiated and led this research and development program for non-explosive release mechanisms. The program objective was to develop, qualify and provide first flight usage of release mechanisms offering improvements in pyroshock output, safety costs and weight over conventional ordnance driven mechanisms. The ARTS program successfully developed and flew Frangibolts, fusible links and laser diode initiators on the ARTS 1 experiment in 1996 and then flew the Fast Acting Shockless Separation Nut (FASSN) on the Space Technology Experiment (STEX) in 1998

90 - 09. Flight operations for a government satellite.

I filled the role of mechanisms subsystem lead for flight operations of a series of long life satellites. My role in flight operations has given me excellent insight into the real world performance of long life mechanisms. I supported the program office prior to launch of this system as a mechanism troubleshooter during failure investigations for a scanning horizon sensor, a deployment mechanism, and a high precision gimbal.

94 - Pres. Program office mechanisms advisor for several satellite programs

I reviewed mechanisms as part of the proposal evaluation teams. Following that I have supported the program office by reviewing contractor mechanisms design and development.

96 - 98 Assistant editor of <u>Space Vehicle Mechanisms, Elements of Successful Design</u>

My role was to review and improve the chapter submissions for this recently published textbook. I wrote the chapter Non-Explosive Release Mechanisms. Performing this effort utilized my experience in spacecraft mechanisms as well as greatly enhancing my knowledge base in the field. This book was published in 1998.

92 - 94 Clementine mechanisms lead engineer.

I was the mechanisms subsystem lead for the Clementine spacecraft. I was responsible for the design, development, production, qualification and flight operations for these mechanisms. The Clementine project went from a blank sheet of paper to launch in 22 months delivering a spacecraft which mapped the moon and discovered ice in the deep craters of the Lunar South Pole.

86 - 96 Upper stage mechanisms subsystem manager

I was the mechanisms subsystem lead for an NRL developed upper stage for the Titan IV rocket. I was responsible for the design, development, production, qualification and flight operations for these mechanisms. I was also the test director for the system pyroshock tests. I transitioned the mechanisms subsystem technology to a company responsible for the recurring production of this vehicle.

90 - 96 Experiment Integrator for two payloads

I was the lead engineer for the mechanical and electrical integration of a two different payloads onto a host satellite.

90 - Pres. Mechanisms Papers Authored:

1. Practical Experiences with Worm Gearing for Spacecraft Power Transmission Applications, 1989
2. Development of a Non-Explosive Release Device for Aerospace Applications, 1992
3. Laser Ordnance System for NRL's ARTS Program 1993
4. Advanced Release Technologies Program 1994
5. The Clementine Mechanisms, 1995
6. Development of a New, No-Shock Separation Mechanism for Spacecraft Applications, 1997
7. Flight Operations Experiences with Long Life Mechanisms, 1999. This paper won the Herzl Award for best paper at 1999 Aerospace Mechanisms Symposium.

Systems Engineering Papers Authored:

1. TiPS: Results of a tethered satellite experiment, W. Purdy, S. Coffey, W. J. Barnds, M. Davis, 1998
2. Geolocation and pointing accuracy analysis for the WindSat sensor, W.E. Purdy, IEEE Trans. on Geosci. and Remote Sensing, vol. 44, no. 3, pp. 496-505, 2006.
3. WindSat on-orbit warm load calibration, E.A. Twarog, W.E. Purdy, IEEE Trans. on Geosci. and Remote Sensing, vol. 44, no. 3, pp. 516-529, 2006.
4. Designing and Managing for a Reliability of Zero. Presented at ESA 4S Symposium, 2010.

EDUCATION

1986 Bachelor of Science, Mechanical Engineering, University of Maryland. 3.8 GPA in major, 3.2 GPA overall