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—— WORK EXPERIENCE

Project Management: Identity-Proofing Equity Research Study

July 2022 - Present

- Hours per week: 40
- General Services Administration - Technology Transformation Services
- Team Size, 7 developers and subject matter experts

Enable decision making for the Agency (GSA) on implementing controversial remote identity proofing technology by leading the development of a statistical study on the diversity equity, inclusion, and accessibility (DEIA) impacts of this technology on various historically-disadvantaged demographic groups.

Manage schedules and milestones to ensure technical, programmatic, policy, and regulatory requirements were met and completed on the needed timelines. Oversee plans, activities, budget, resources, and labor to deliver a the successful implementation of the study.

Build relationships with contracting officials, agency leadership, and executive sponsors to ensure alignment with the Agency's vision, policies, and requirements.

Lead a multidisciplinary team of up to 7 contractors working using an Agile software development methodology to customize the orchestration platform and build new micro-services to connect the multiple system that make up the study's technical layer.

Manage multiple vendors to ensure they meet the adhere to the technical, information security, and privacy requirements as well as manage their delivery schedule to integrate their products into the study's technology platform.

Collaborate with external vendors to design and implement a social media recruitment campaign and a landing page/website and to design and execute a fraud testing campaign. Develop and collect requirements for acquisitions solicitations and requests for information (RFI). Evaluate vendor proposals for government contracts.

Develop, articulate, and communicate strategies for building the technical platform, recruiting participants, conducting the study, and writing and analyzing the statistical results in collaboration with dozens of stakeholders. Studied the identity proofing industry by reading industry magazines, watching webinars, and attending industry meetings to understand the merits of our study. Initiated conversations with other government agencies working in the space to better understand the landscape and find blind spots and deficiencies in our approach to statistics and study design.

Work closely with the privacy office, office of general counsel, office of acquisitions, and office of customer experience, and the IT Security team, to tailor requirements, understand and clarify expectations, and review our study implementation for risks, gaps, and misunderstandings.

Explored creative options to fully utilize, commit, and obligate full fiscal year budgets by tailoring requirements and de-scoping work that was no longer needed for the successful completion of the study.

Program Manager: NASA's core Flight System

October 2019 - July 2022

- Hours per week: 20
- NASA Goddard Space Flight Center, Greenbelt, MD (10,000+ staff)
- Team Size, 5-10 developers, testers, and subject matter experts
- Product repository: https://github.com/nasa/cFS
- Product statistics and info: https://www.openhub.net/p/nasa-cfs
- Product Website: https://cfs.gsfc.nasa.gov/

The core Flight System (cFS) is an *open-source software framework* that is the command and data handling backbone for many of NASA's spacecraft, including the upcoming Lunar Gateway. cFS can be though of as "Android or iOS for spacecraft" and has users and stakeholders across the aerospace industry, international agencies, and academia.

Design new solutions: To more easily communicate compatibility across the multiple dependencies, I led the adoption of a "version codename" that all compatible components share and help identify and coordinate joint releases. The new codename approach also has also reduced the paperwork required to receive approval through our organization's software release processes. Additionally, migrated individual components' version number to align with industry-standard "semantic versioning" and maintain compliance with organizational regulations.

Develop continuous integration pipeline: Worked with the team's experts to develop and implement continuous testing on all of our code changes to ensure a high-quality and reliable product regardless of where the code contribution came from.

Maintain version control system: Maintain 13 interconnected *git repositories* that make up the cFS framework. This involves hosting weekly code reviews with stakeholders from across NASA and daily standups to address problems with the team and keep us motivated and making progress.

Manage the product vision: Informed by questions and suggestions from stakeholders inspire future product roadmap features. We recently developed reusable continuous integration and delivery pipelines with github actions to maintain both our product quality, robustness, and even cybersecurity as well as provide users an easy way to test their own modifications to the code-base.

Develop and maintain a strategic vision by partnering with the Software Engineering Division, the legal counsel team, and the strategic partnerships office to manage and protect the product's brand and expand our open-source licensing.

Perform end-user research: gathered qualitative and quantitative data on user preferences, behaviors, and common points of confusion to create an online contributing guide where users can become familiar with our development process and find documentation across the product's large codebase of 11 interdependent git repositories.

Engage with customers and stakeholders: I work with the team's subject matter experts to ensure that our stakeholders and end-users receive timely implementation advice and help so they can leverage our software to achieve their commercial and educational objectives. This support to our end-users directly addresses our organization's strategic objective of supporting the business community through fundamental technology development as well as empowering the next generation of the science, technology, engineering, and mathematics (STEM) workforce who are currently using our product in academia.

Cultivate relationships: To navigate an consistently uncertain and unstable funding profile, I field inquiries for partnership opportunities across the federal government, private industry, and academia by

- developing and delivering training courses for different experience levels,
- modernizing the product's website and documentation for readability, engagement, and usability,
- advocating for funding and presenting to senior leaders and funding organizations
- hosting sessions at the yearly Flight Software Workshop and serving on its organizing committee

Culture change and influence: the aerospace software community is steeped in regulations, policy, and processes from the waterfall era. I am integrating an Agile Software Development mindset and practices by amplifying the voices of new talent and stakeholders and nudge the cross-functional development team that maintains the product.

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Associate Branch Head: Flight Software Systems

10/2019 - July 2022

- Hours per week: 20
- NASA Goddard Space Flight Center, Greenbelt, MD (10,000+ staff)
- Team Size, ~40 team leads, developers, and testers
- Website: https://sed.gsfc.nasa.gov/etd/582

The *Flight Software Systems Branch* provides on-board, embedded software products that enable spacecraft hardware, science instruments and flight components to operate as an integrated on-orbit science observatory.

As an associate head for the flight software systems I serve *over 40 civil servants* of various experience levels and who work on over 6 *different cross-functional projects*. These teams also include contractors resulting in an organization of *more than 100 people.*

Communicate Effecively: Helped branch members prepare for presentations through storyboarding their talks and helping them distill their message using methods such as the "5 Ws" (Who, What, Where, When, Why). Also teach a short

presentation skills course based on design-forward frameworks like Pecha-Kucha and Ignite Talks.

Talent Strategy and Culture: Maintained an environment that fosters connection, engagement, teamwork, and innovation by *writing award nominations* so people in our branch could be recognized and appreciated. Established daily *office hours* (similar to college professors) where branch members can drop in and discuss any challenges and concerns one-on-one. These have been an excellent way to emulate the "open door" culture we had before full-time remote work.

Knowledge Transfer: Designed a course on using the "git" version control system which is still new to many engineers in the branch. The lack of familiraity with the tool was starting to cause business problems with schedule and productivity. Helped organize a "branch processes" course with the Software Process Improvement team that covers how the branch meets NASA's standards and policies when developing mission-critical flight software.

Leading through uncertainty Provided strategic advice to senior leadership in anticipation and response to problems with funding and lack of direction. Consulted with team leads, stakeholders, and developers to garner support for staff and work environment issues.

Strategic Staffing and Hiring: Led 4 hiring actions for team leadership positions for high-visibility spaceflight programs. Utilized creative hiring authorities and systematized our interview and evaluation process by using Sharepoint Lists and Microsoft Forms to develop a comprehensive database to organize resumes, interview dates, and open positions to provide an at-a-glance dashboard of our hiring efforts.

Digital Transformation: Pushed the full-scale adoption of modern collaboration tools like persistent topic-based chat rooms (Microsoft Teams) so people can communicate seamlessly. This also increased engagement of remote workers by encouraging people to use their webcams in virtual conferences thereby providing a human face and a more connected experience for the organization.

Process Improvement: Led the transformation of branch management operations by instituting daily standups and the use of a Kanban board for action tracking. Also started monthly, Agile-inspired, retrospectives to focus on continuous improvement and strategic initiatives.

Product Development Lead: SmallSat Attitude Control System

September 2018 - October 2019

◆ Hours per week: 40
◆ NASA Goddard Space Flight Center, Greenbelt, MD (10,000+ staff)
◆ Team Size, 1-6 analysts and interns

I served as the technical lead for the guidance navigation and control (GNC) system's hardware and software for the *Small Satellite* product line. I collaborated with multi-disciplinary teams to define requirements, design, and develop the GNC system for three custom-developed spacecraft that leveraged common hardware and software. Managed the subsystem's cost, schedule, and performance budgets (pointing accuracy, power, and mass).

Created a roadmap and development flow to create requirements, determine hardware component feasibility, and develop necessary algorithms.

Designed and implemented modular software and modeling architecture that solved the never before attempted business problem of developing multiple spacecraft simultaneously. I leveraged existing modeling tools, modern version control systems (git), task management processes (Kanban boards, gitlab), and platform-agnostic computing environments (based on Docker containers) along with a plug-and-play paradigm for each mission's custom configurations and algorithms (by using a socket-based inter-process-control architecture).

Adapted Agile development practices to prioritize and delegate work across our small part-time and transient team of four engineers. We leveraged daily check-in meetings organized around task and prioritized our progress as a self-organizing team by holding each other accountable through regular "retrospectives" where we examined how we could improve our working processes and methods. My role was that of a coach, guiding the team, eliminating barriers to success by teaching and connecting engineers with subject matter experts, and working with each project's managers and scientists to understand requirements, clarify schedules, and report progress and challenges.

Developed Talent: Hired and led a team of four students to develop the software and analysis architecture. This involved assessing the student's technical competence to better connect them with an appropriate task and motivate them to succeed in a short-term and high-paced summer project.

Collaboration Culture: Built a culture of collaboration, accountability, and vulnerability by starting the students' experience with a preliminary assignment where they would need to create and deliver a presentation about GNC systems. This topic was new to almost all of the students and forced the students to understand and leverage each other's strengths as well as become used to giving and receiving feedback from peers and mentors alike. I also exemplified this culture by soliciting and applying their feedback on my mentoring skills and project management methods.

Subsystem Lead: Instrument Pointing Control System Proposal

October 2018 – May 2019

◆ Hours per week: 40
◆ NASA Goddard Space Flight Center, Greenbelt, MD (10,000+ staff)

Developed budgets, personnel, and schedule plans for the Pointing Control System of a three-axis International Space Station Payload Proposal. Closely collaborated with a multidisciplinary team of project managers, business development professionals, scientists, and engineers persuade them into committing staff and resources necessary to meet aggressive project requirements.

Constructed estimates of the pointing system engineering team labor cost, schedule, and technical aspects including risk management of the project/program.

Proposal Writing: I wrote and proofread parts of the proposal and prepared charts for the site visit review as well as requirements for a systems requirement review. Collaborated with graphics designers and publishing professionals to perfect the visual layout of the proposal.

Lead Developer: Instrument Pointing Control System

April 2018 – March 2019

◆ Hours per week: 40
◆ NASA Goddard Space Flight Center, Greenbelt, MD (10,000+ staff)
◆ Website: https://gedi.umd.edu/mission/mission-overview/

The Global Ecosystem Dynamics Investigation (GEDI) produces high resolution laser ranging observations of the 3D structure of the Earth. GEDI's precise measurements of forest canopy height, canopy vertical structure, and surface elevation greatly advance our ability to characterize important carbon and water cycling processes, biodiversity, and habitat.

Provided technical leadership supported requirements analysis, design, development, verification, and validation for the International Space Station's GEDI science payload. This included sustaining engineering and maintenance of the Pointing Control System's flight software where, during the commissioning phase I developed and delivered new software parameter tables and updates to our pointing control flight software.

Designed System for compatibility with physical and functional interfaces and assured compliance with system requirements, mission objectives, and design constraints.

Developed interface control documents and system verification and test specifications involving the pointing system elements including parts of the ground support simulation software.

Manage system integration and test activities resulting in a flight-qualified design and acceptance-tested pointing control system.

Collaborated with the Flight Software Lead and Testing Team to develop and modify requirements, create and execute test plans, and analyze test artifacts to verify and validate system performance. This process required continuous and close interaction with people from multiple teams and disciplines all whom had competing priorities and metrics. I negotiated with the different teams to arrive at requirements and validation strategies that everyone was confident in as well as identifying and accepting the associated risks inherent in these compromises.

Principal Investigator: SmallSat Attitude Control Actuator

October 2015 - January 2019

◆ Hours per week: 10
◆ NASA Goddard Space Flight Center, Greenbelt, MD (10,000+ staff)

As a principal investigator for NASA-GSFC's internal research and development program I wrote, won, and worked on 3 different research and development projects to develop and test new spacecraft technologies mainly focused on small satellite applications.

Planned the schedule and budget to develop two separate projects. I had to develop funding and manpower budgets for multiple proposals and when selected I was tasked with maintaining technical and administrative oversight of the projects.

Directed the development of a new momentum exchange actuator, or reaction wheel, for small satellites. I developed and prototyped a packaging innovation for small spacecraft reaction wheels. Reaction wheels control the attitude of the spacecraft by affecting the system's angular momentum. The packaging innovation aimed to integrate the wheels into the structure and eventually have attitude control on three axes for a 1U, a 10x10x10cm cube, CubeSat.

Market research and literature reviews recruited experts from mechanical engineering, electrical engineering, and material science groups to understand loads, power requirements, and test commercial components in space-like environments.

Managed multiple interns throughout the life of the project and collaborated with academic advisers to provide scholarly research opportunities for the students.

—— EDUCATION

University of Michigan Ann Arbor, MI United States

- Doctorate Degree, Awarded *January 2015*
- Major: Aerospace Engineering

Massachusetts Institute of Technology Cambridge, MA United States

- Bachelor's Degree, Awarded *June 2008*
- Major: Aeronautical and Astronautical Engineering

—— JOB-RELATED TRAINING

Leadership Programs

Gov21: The 21st Century Leadership Program

- Completed *August 2020*
- Website: https://ourpublicservice.org/programs/gov21/

Leadership at All Levels professional certificate program on MITxPro

- Completed *July 2019*
- Strategy, Products, Capability Work, and Teams
- Negotiation, Influence, and Power
- Leading Change in Organizations
- Discovering and Implementing Your Leadership Strengths
- Website: https://xpro.mit.edu/programs/program-v1:xPRO+LASERx/

NASA Foundations of Influence, Leadership, Relationships, Success, and Teamwork (FIRST)

- Completed *June 2019*

NASA Science Communicators Workshop

- Completed *December 2016*

NASA GSFC Leadership Development and Excellence in Management (LDEM-A)

- Completed *October 2015*

Brookings Executive Education: Strategic Thinking: Driving Long-Term Success

- Completed *February 2018*

Brookings Executive Education: Leading Innovation and Creating New Value

- Completed *May 2017*

NASA-GSFC Road to Mission Success

- Completed *October 2016*

NASA GSFC Technical Managers Training

- Completed *April 2016*

—— OTHER LANGUAGES

- **Spanish:** Native speaker

—— ACADEMIC PUBLICATIONS:

In chronological order:

Zhao, Zhanzhan, Gerardo Cruz, and Dennis S. Bernstein. "Adaptive Spacecraft Attitude Control Using Single-Gimbal Control Moment Gyroscopes Without Singularity Avoidance." Journal of Guidance, Control, and Dynamics 42, no. 11 (2019): 2342-2355.

http://dsbaero.engin.umich.edu/wp-content/uploads/sites/441/2019/08/AdaptiveAttitudeControlCMG.pdf

Zhao, Z., Cruz, G., Lee, T., & Bernstein, D. S. (2018, June). Adaptive Attitude Control of a Dual-Rigid-Body Spacecraft with Unmodeled Nonminimum-Phase Dynamics. In 2018 Annual American Control Conference (ACC) (pp. 2503-2508). IEEE.

http://dsbaero.engin.umich.edu/wp-content/uploads/sites/441/2019/06/486.pdf

Cruz, G., & Bernstein, D. S. (2016, July). Noncolocated adaptive attitude control of a planar two-body linkage with nonminimum-phase dynamics. In 2016 American Control Conference (ACC) (pp. 4954-4959). IEEE.

http://dsbaero.engin.umich.edu/wp-content/uploads/sites/441/2019/06/465.pdf

Cruz Ortiz, Gerardo E. "Retrospective Cost-based Adaptive Spacecraft Attitude Control." PhD diss., 2015.

https://deepblue.lib.umich.edu/bitstream/handle/2027.42/111607/gecruz_1.pdf?sequence=1

Sobolic, F. M., Cruz, G., & Bernstein, D. S. (2015, July). An inner-loop/outer-loop architecture for an adaptive missile autopilot. In 2015 American Control Conference (ACC) (pp. 850-855). IEEE.

http://www-personal.umich.edu/~dsbaero/library/ConferencePapers/MissileACC2015.pdf

Cruz, G. E., & Bernstein, D. (2013). Retrospective cost adaptive control of spacecraft attitude using magnetic actuators. In AIAA Guidance, Navigation, and Control (GNC) Conference (p. 4563).

https://deepblue.lib.umich.edu/bitstream/handle/2027.42/106485/AIAA2013-4563.pdf?sequence=1

Camblor, M., Xie, A., Cruz, G., Esteban, S., Lee, T., & Bernstein, D. (2013). A numerical comparison of inertia-free attitude control laws for a spacecraft with a discrete flexible mode. In AIAA Guidance, Navigation, and Control (GNC) Conference (p. 4562).

https://deepblue.lib.umich.edu/bitstream/handle/2027.42/106484/AIAA2013-4562.pdf?sequence=1

Cruz, G., & Bernstein, D. S. (2013, June). Adaptive spacecraft attitude control with reaction wheel actuation. In 2013 American Control Conference (pp. 4832-4837). IEEE.

http://dsbaero.engin.umich.edu/wp-content/uploads/sites/441/2019/06/430.pdf

Cruz, Gerardo, Anthony D'Amato, and Dennis Bernstein. "Retrospective cost adaptive control of spacecraft attitude." In AIAA Guidance, Navigation, and Control Conference, p. 4624. 2012.

http://dsbaero.engin.umich.edu/wp-content/uploads/sites/441/2019/06/405.pdf

Weiss, Avishai, Gerardo Cruz, Kshitij Agarwal, Yousaf Rahman, Madhura Medikeri, Antai Xie, Marc Camblor, Ilya Kolmanovsky, and Dennis S. Bernstein. "Inertia-free Attitude Control Laws Based on Rotation Matrices for Spacecraft with Torquers, Thrusters, and Wheels." In Proc. Itzhack Y. Bar-Itzhack Memorial Symposium on Estimation, Navigation, and Spacecraft Control, pp. 322-391. 2012.

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.723.4643&rep=rep1&type=pdf

Camblor, Marc, Avishai Weiss, Gerardo Cruz, Yousaf Rahman, Sergio Esteban, Ilya V. Kolmanovsky, and Dennis S. Bernstein. "A comparison of nonlinear PI and PID inertia-free spacecraft attitude control laws." In Itzhack Y. Bar-Itzhack Memorial Symposium on Estimation, Navigation, and Spacecraft Control, pp. 517-541. Springer, Berlin, Heidelberg, 2012.

http://www-personal.umich.edu/~dsbaero/library/ConferencePapers/InertiaFreeAttitudeControBIBook.pdf

Cruz, G., Yang, X., Weiss, A., Kolmanovsky, I., & Bernstein, D. (2011, July). Torque-saturated, inertia-free spacecraft attitude control. In AIAA Guidance, Navigation, and Control Conference (p. 6507).

https://deepblue.lib.umich.edu/bitstream/handle/2027.42/90734/AIAA-2011-6507-816.pdf?sequence=1

—— OTHER INTERESTS

Gov21 Alumni Design Project

Practicing Human Centered Design techniques to "enable alumni to successfully implement Gov21 techniques to achieve more meaningful and fruitful interactions at work."

Mentor and Board Member: NASA-GSFC Early Career Network

Bases on community feedback, founded a grassroots organization to experiment with human-centered design approaches to creating community, growing our network, and provide personal and professional development to new engineers. We organize and deliver monthly workshops using facilitation frameworks such as liberating structures.

Founding Member: NASA-GSFC Engineering Early Career Retreat

Developed a day-long retreat to understand the experiences of early career engineers and design programs as well as management and culture interventions to improve the morale of our next-generation of engineers.

Leadership Team member of the NASA-GSFC Engineering Transformational Strategic Team's Effectiveness Group

Led customer empathy interviews to address the effectiveness of the Engineering Directorate's relationship with institutional stakeholders including project managers and scientists.

Dance Instructor

DC Style Salsa Academy and BailaDC
Develop curriculum and teach over 20 students twice a week. Focus on the fundamentals of latin dancing through mindfulness, interpersonal connection, and communication.

—— MEDIA INTERVIEWS

NASA African-American History Month Outreach Video:
http://www.ustream.tv/recorded/100256691

"Gerardo Cruz-Ortiz, Creative at Work and at Play - From Software to Salsa"
https://www.nasa.gov/feature/goddard/2020/gerardo-cruz-ortiz-flight-software-systems-associate-branch-head-and-salsa-dancer