

# Zahra Khan

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## SELECTED EDUCATION

### **Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts**

#### ***Masters of Science in Aeronautics and Astronautics (2008) | GPA: 5.0/5.0***

- Thesis Title: Entry, Descent and Landing Vehicle Design Space Exploration for Crewed Mars Missions
- Key Courses: Space Systems Engineering, Satellite Engineering, Astrodynamics, Optimization Methods

#### ***Advanced Studies Program – Non-degree (2015)***

- Key Courses: Intro to Electrical Engineering and Computer Science, Intro to Astronomy

### **Carleton University, Ottawa, Canada**

#### ***Bachelor of Engineering with High Distinction (2005): Aerospace Engineering***

- Class Rank: 1/65 in Aerospace Engineering | 9/325 in All Engineering

## SKILLS

- **Software:** Matlab, JIRA, DOORS, GitHub, Fluent, Pro/Engineer, LabView, Aerodynamic Preliminary Analysis System | Languages: C++, HTML, Python
- **Fabrication:** precision metal machining, MIG welding, plastics casting and moldmaking, woodworking
- **Languages:** Urdu (fluent), French (intermediate), American Sign Language (beginner)

## SELECTED EXPERIENCE

**Waymo** – Mountain View, CA, Sept. 2020 – Present

### ***Systems Engineer – In Car Experience***

- Developing and flowing down requirements and conducting architecture trades for features impacting both test driver and rider experience for multiple autonomous vehicle projects
- Soliciting design needs and building consensus on requirements as well as architecture trades with a multidisciplinary team of stakeholders including product management, safety, operations, software, hardware, fault protection and system engineering colleagues
- Collaborating with test engineers for requirements verification planning & test data analysis
- Troubleshooting problems identified through verification testing as well as during operations
- Initiating and developing system engineering process improvement projects

**Columbus Technologies and Services** – Pasadena, CA, May 2017 – March 2020

### ***System Engineer III, NASA Jet Propulsion Lab***

- Worked on the Mars2020 rover mission as a system testbed engineer. Contributions include:
  - Developed and implemented procedures for system-level integration and verification and validation testing of Mars2020 avionics focusing on Entry, Descent and Landing (EDL) systems
  - Supported testing in both system testbed venues and Assembly, Test and Launch Operations (ATLO) facilities as well as data reviews for closing verification activities
  - Developed Python scripts for testbed safety checks and for implementing test procedures
- Received the Mars2020 2019 Team Award for supporting System Test 1
- Completed a course on Planetary Entry, Descent and Landing Systems taught by Dr. R. D. Braun

**Kavli Institute for Astrophysics and Space Research, MIT** – Cambridge, MA, Aug. 2013 – Jan. 2017

### ***Assistant Project Engineer***

- Worked on the Transiting Exoplanet Survey Satellite (TESS) mission as a system engineer for the instrument as part of a NASA Silver Achievement Medal winning team. Contributions include:
  - Developed requirements and associated verification activities for the instrument and subsystems based on science requirements and engineering constraints
  - Performed mission assurance analyses including failure modes and effects analysis (FMEA) and fault tree analysis (FTA) to identify mitigations needed
  - Planned and implemented contamination control including contamination analyses, developing requirements and procedures, and measuring contamination levels in cleanrooms
  - Developed a user guide for the instrument to be used for on-orbit commanding by ground

**Engility Corporation** – Billerica, MA, Jan. 2009 – Jun. 2013

### ***Research Engineer***

- Analyzed future air traffic management concepts to identify requirements and research directions
- Designed and conducted experiments to evaluate feasibility of novel air traffic control concepts

- Developed algorithms and models of aircraft flight procedures, human air traffic controller actions and air traffic control automation software in collaboration with in-house software and analysis team as well as external consultants
- Delivered presentations to clients on analysis process and results as well as to industry professionals through participation in conferences

**Education Associates Program, NASA Ames Research Center – Moffett Field, CA, Jun. 2008 – Dec. 2008**  
**System Engineering Intern**

- Conducted various trade studies involving subsystem interactions for the Lunar Atmospheric and Dust Environment Explorer (LADEE) mission; Liaised with subsystem designers to assess impacts of design changes to other subsystems; Provided study results to managers in a succinct form to facilitate system-level decision-making
- Assisted the Mission Design Center with various missions in a system engineering capacity; Tasks included mission objectives and requirements identification and flow-down, defining system-level trade study parameters, integrating subsystem information, highlighting and investigating subsystem interactions, and evaluating various subsystem designs against performance requirements

**Department of Aeronautics and Astronautics, MIT – Cambridge, MA , Nov. 2006 – May 2008**  
**Research Assistant, System Architecture Research Group**

- Developed a Matlab tool for design space exploration of Planetary Entry, Descent and Landing (EDL) vehicles including trajectory modeling and propulsion system sizing as part of thesis research
- Conducted parametric analysis to identify factors with greatest impact on the EDL design space for human Mars missions and evaluated promising vehicle designs in collaboration with members of the System Architecture Research Group working on structures and other spacecraft subsystems
- Conducted aerodynamic analysis for planetary entry vehicle designs using the Aerodynamic Preliminary Analysis System (APAS) and provided results for use in stress analysis to team members
- Identified critical areas of research and development to improve the capability of EDL vehicles for human Mars missions
- Results of this work contributed to a study interfacing with the NASA Mars Architecture Working Group

**AWARDS AND HONORS**

- NASA JPL Mars2020 2019 Team Award (2019)
- NASA Silver Achievement Medal as part of TESS team at MIT (2019)
- MIT Department of Aeronautics and Astronautics Fellowship (2006-2007)
- Natural Sciences and Engineering Research Council of Canada Post Graduate Scholarship (2006-2008)
- J. Armand Bombardier Internationalist Fellowship (2006-2007)
- Commonwealth Scholarship to the United Kingdom (2006 – Declined Award to attend MIT)

**SELECTED PUBLICATIONS**

- **Khan, Z.**, Idris, H., Consiglio, M. and Wing, D., “Surveillance Range and Interference Impacts on Self-Separation Performance”, Proceedings of IEEE/AIAA 30<sup>th</sup> Digital Avionics Systems Conference (DASC), Seattle, WA, Oct. 16-20, 2011.
- **Khan, Z.**, Idris, H., Vivona, R., Woods, S. and Lanier, R., “Ground Automation Impact on Enabling Continuous Descent in High Density Operations”, Proceedings of AIAA 9<sup>th</sup> Aviation Technology, Integration, and Operations Conference (ATIO), Hilton Head, SC, Sep. 21-23, 2009.
- **Khan, Z.** and Hoffman, J., “Key Directions for Entry, Descent and Landing Research for Crewed Mars Missions”, Proceedings of AIAA SPACE 2009 Conference and Exposition, Pasadena, CA, Sep. 14-17, 2009, AIAA-2009-6609.

**SELECTED LEADERSHIP AND ACTIVITIES**

- NASA International Space Apps Challenge, Subject Matter Expert and judge (2020)
- EngineerGirl.org, Virtual Mentor – Answering questions about engineering careers (2013 – Present)
- MIT Space Balloon Team, Designed and built an audio “art” system to map air pressure changes as a payload for the balloon (2015)
- Hacking Arts at MIT, Winner of “Most Disruptive Hack” award for a street theater production system (2014)
- MIT Terrestrial Artificial Lunar and Reduced Gravity Simulator (TALARIS) Team, Assisted with hopper landing gear design including concept generation and prototyping (2009-2011)