Harold Martin
CA3/FOD
Fall2014/Spring2015

Final Internship Abstract

- What were the main programs or projects that you worked on during your internship and what were your main duties within each project?
    - FOD Mission Operations Systems Modeling
        - Generic spaceflight operations process updates (product exchanges, process flow updates and database corrections).
    - Boeing CST-100
        - Mission Data Load process and product development
        - Ground controller display development
        - Tool development (landing site, workflow monitor, sequence monitors, MDL automation, command/telemetry audit/validation, risk macro)
        - XTCE code validation and correction
- What were your major accomplishments during your internship?
    - The definition and development of the product structure and process that the Boeing CST-100 vehicle will use to generate and execute their automated onboard sequences.
- What are the 3 biggest things you learned during your internship?
    - How to lead Engineering meetings.
    - How spacecraft subsystems work.
    - How to build flight controller displays.
- What aspect of your internship did you enjoy the most?
    - The opportunity to learn from experienced people who have contributed to the space program and the awesome chance to work at the leading space exploration company (NASA).
- Did you complete any large-scale projects during your internship (i.e. presentations, reports, research)? If so, please describe.
    - Spacecraft Integration Operations Panel presentations on the mission data load process and products.
    - 10 ground controller displays completed (including application to simulate telemetry flow).
- How has your internship experience influenced your future career and education plan?
    - It has definitively influence my career. For now, I plan on going back to school to complete my advance education and come back to NASA in the future.

CA3 Technical Integration

Harold Martin

- It has been a great tour.
- I have learned a lot.
- I have been involved in a lot of projects.
- Everyone has been awesome.

Justkidding!!

About Me:

- Early Life:
    - I was born and raised in Cuba.
    - Oldest of three children (2 boys / 1 girl).
    - Liked electronics and computer from a very early age (can't remember when it started).
    - Learned first computer language when I was 10 (Pascal) and no one uses it anymore.
    - Moved to Miami, FL when I was about to turn 16 years old and have been there ever since.

- First Words:
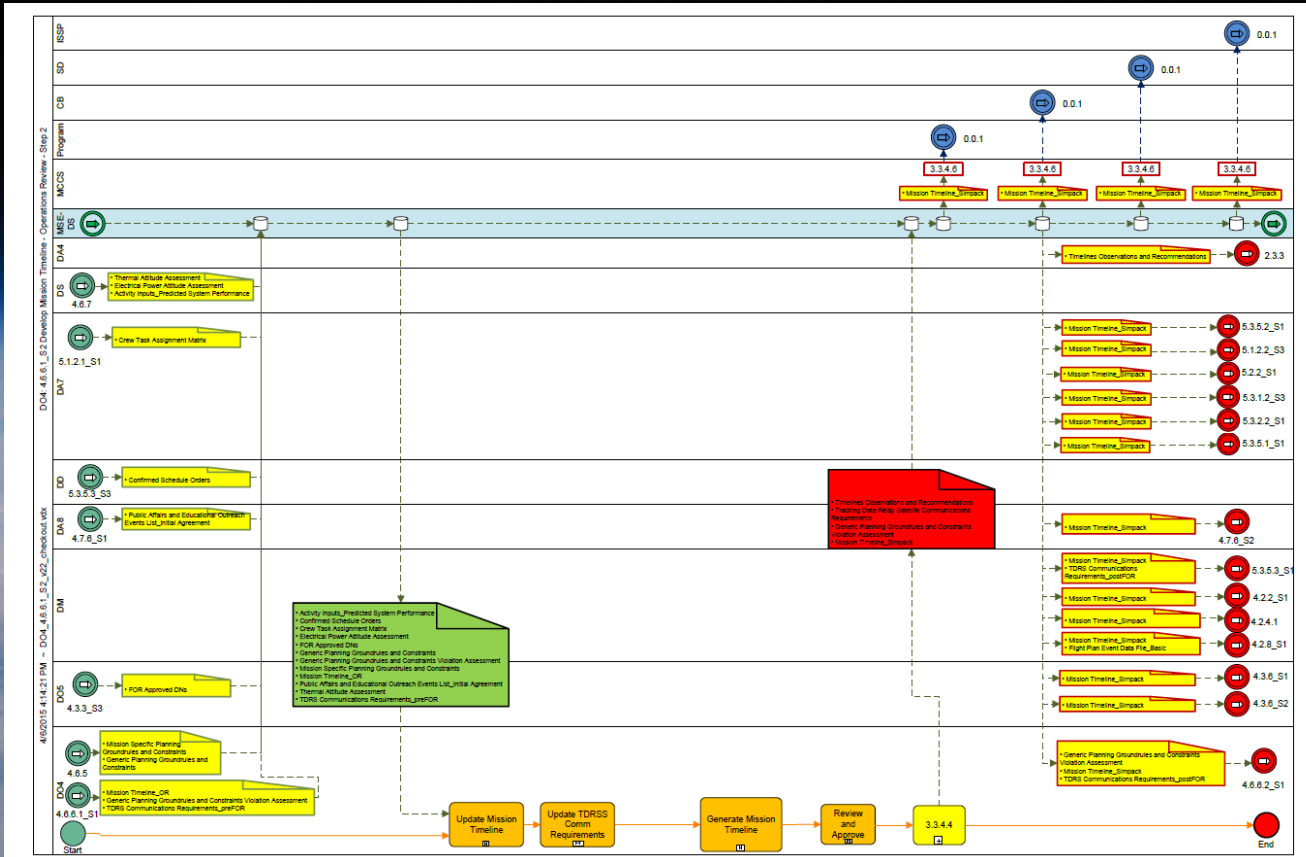   "Tornillo" and "Croqueta"

About Me
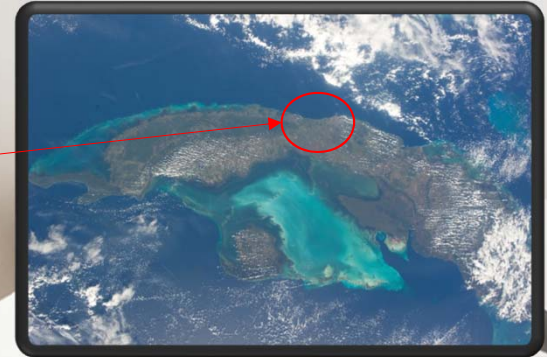
Education:

- Southwest Miami Senior High School
  High school Diploma (Spring 2010)

- Florida International University
  BS Electrical Engineering (Spring 2014)
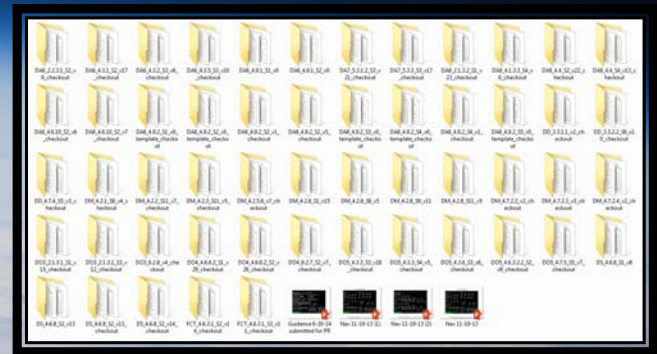 MS Computer Engineering (In progress)

Why you brought me in:
(back from a time no one remembers)

PFDs

- Worked on them for 2-3 months.
- They are great but take forever to load.

Crew Interface Systems(CIS) Mission Data Loads(MDL) Inputs

What they are:
- They are files that contained some of the data shown in the crew Displays.

What did I do:
- Familiarize myself with what they are.
- Convened and led meetings to discuss the content and data.
- Identified issues with structure and missing parts.
- Integrated the data generators with the flight software coders to develop a data structure that will contain all necessary data and be formatted to be ingested correctly into the flight software for release
- Validation with interested parties (CIS, Crew and Mission Systems(CMS), Mission Operations (MO), Avionics and Software (AV&SW), Guidance Navigation and Control (GNC), and others).

What did you get from this (MO/Boeing):
- An understanding of how MDLs work and what they are.
- An actual set of working data.
- Save money
- Save time

What did I get from this:
- Expanded my knowledge (very little in the beginning) of spacecraft systems.
- Got to interact with smart/outstanding people.
- Learned what an MDL was.
- Learned how to lead Engineering meetings.

Landing Site Tool

What they are:
- It is a tool that collects landing site information from an spreadsheet and generates an input file (Keyhole Markup Language KML) for Google Earth and MDLs for the spacecraft.

What did I do:
- Coordinated with GNC subject matter experts(SMEs).
- Learned how CST-100 chooses a landing site and what information it needs.
- Learned what KML files are and how they are structured.
- Familiarized myself with the spacecraft MDLs structure and information.
- Developed a tool that takes in information about the landing sites and generates a KML file for Google Earth overlay and MDLs for CST-100.

What did you get from this (MO/Boeing):
- A tool that generates visual representations of the landing site shapes and locations.
- A configuration management(CM) tool that allows you to maintain information for multiple files in a single source.
- Saved time and money.

What did I get from this:
- Expanded my knowledge of spacecraft systems; how GNC deorbits and lands the spacecraft.
- Learned how landing sites are prioritized.
- Learned what KML is and how it works.
- Got to interact with smart/outstanding people.
- Lead Engineering meetings.

Onboard Flight Manager(OFM) Mission Data Load(MDL) Inputs

(I'm told this was a huge one)

What they are:

- OFM is the onboard flight manager which tells the vehicle what to do during flight. The MDL contains instructions that OFM will follow.

What did I do:

- Coordinated with GNC, CMS, MO, and FSW subject matter experts(SMEs).
- Learned how CST-100's OFM is designed and how it works.
- Familiarized myself with the OFM MDLs structure and information.
- Convened meetings between AV&SW, CMS, and MO to fix/resolve issues with the OFM MDL Workbook (WB).
- Developed java tools that ingest mission specific data and populates the OMF MDL WB.
- Created and went through peer review processes and presented at the Spacecraft Integration Operations Panel (SIOP).

What did you get from this (MO/Boeing):

- An understanding and a process to fill in/populate the OFM MDL WB.
- An interim tool (while we wait for a formal tool) to generate the WB.
- Save precious time and money.

What did I get from this:

- Got to know how CST-100 operates and how OFM was designed and its operation.
- Perfected mediation abilities.
- More Java experience.

MDT Displays (fun for everyone)

What they are:
- MDT (MOD Display Tool) is a new tool for building Mission Control Displays that will be used for MCC-21 (the new version of the control center) and for the CST-100 missions.

What did I do:
- Tracked down and MDT manual and the MDT developers.
- Learned how to efficiently code in MDT.
- Collaborated/Integrated with subsystems SMEs to understand CST-100 subsystems and other divisions.
- Familiarized myself with CST-100 subsystems (EPS, ECLSS, NDS, GNC, …).
- Familiarized myself with CST-100 crew displays.
- Developed Emulated Crew Displays.
- Taught coworkers how to use MDT and build displays.

What did you get from this (MO/Boeing):
- 23/33 Crew displays built in MDT.
- 10 of such by me; others by coworkers (Pete, Susan, Eddie, Kayleigh, and JZ)
- Free MDT classes ☺

What did I get from this:
- Learned MDT language.
- Got super familiarized with CST-100 subsystems; specially Electrical Power Systems (EPS). Huge plus for me ☺.
- Some of the code I developed will be used in new MCC tools and applications. (for posterity)

XTCE Tool (Michael's)

What they are:
- The XTCE(XML Telemetry and Command Exchange) tool (developed by Boeing/Michael Nieves) takes telemetry and command information from Boeing's CCTsdB and creates an XTCE report to be ingested by NASA's MO.

What did I do:
- Learned XTCE.
- Get more familiarized with the CCTsdB.
- Identify XTCE schema issues/violations in the report and database data errors.
- Work with CMS and MO to tackle and fixes the issues.

What did you get from this (MO/Boeing):
- A more accurate reporting tool.
- A working/valid XTCE report.
- Saved time and money (thousands if not millions of $$ ☺).
- Made people's lives easier.

What did I get from this:
- Learned XTCE and how NASA and Boeing manage telemetry.
- More Java practice.
- Refined mediation abilities. (Almost a meeting expert by now ☺)

Duties As Assigned(AKA: small stuff)

Deploying MDT Displays into MSDE (Mission Support Development Environment) and MSE (Mission Support Environment) for Boeing's trainers
- This allows the Boing Training Simulation at Tower II to EOD (Exceed on Demand) into the MCC and run the displays that the flight controllers would see.

Ops History Proxy
- This was a proxy application I developed to be able to notify interested parties when documents were developed to OpsHistory without them having to be logged in into the system while they wait.
- It saved time and money because we didn't have to outsource the development.

Updating Risk Macros
- There are some Macros that MO (Susan Beisert) uses to ingest Athena DB reports and generate Risk Reports.
- These macros stop working on don't work correctly every time the DB reports change.
- Every time the reports changes I modified the macros so they would work again.
- Modified the macros to add some more information to the Risk Reports.

And, let's face it.

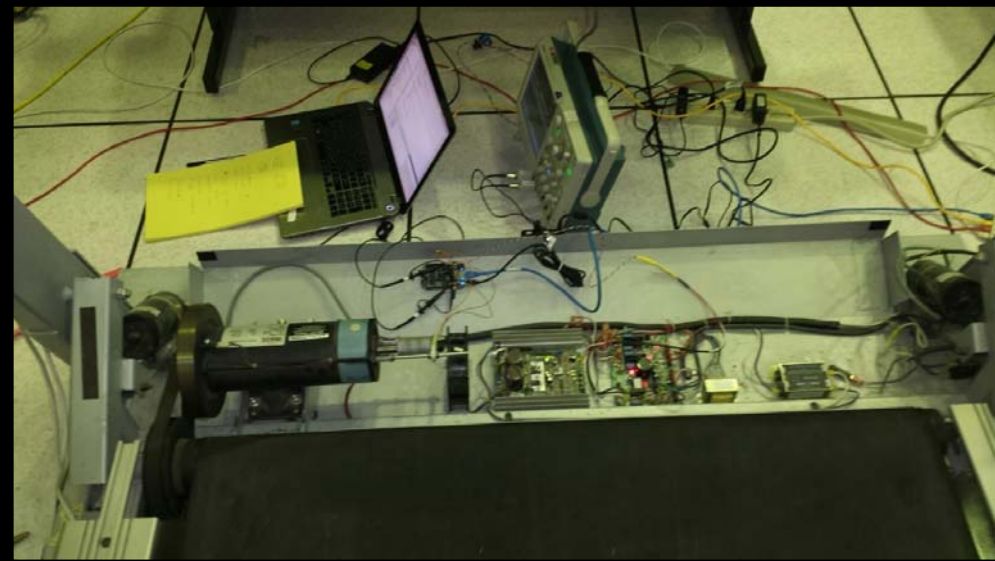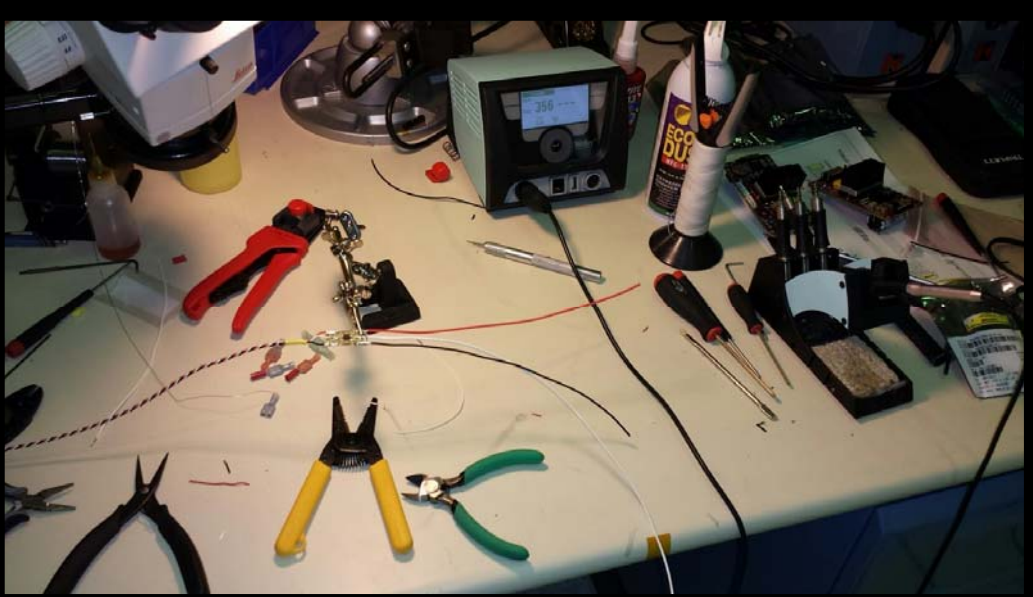Because I wasn't busy enough and was often found slacking around.

I was allowed to go work for the Engineering Directorate (ER) over at building 36.

ER Projects

(During some time of my last 4 weeks)

Work Environment:

Treadmill Speed Control:

What was needed:

- Needed to control the speed of a treadmill for Valkyrie to walk on.

What I had to do:

- Re-familiarize myself with the Beagle Bone Black (BBB).
- Find and install a proper operating system in the BBB.
- Adapted an Ecoder to the output of the motor shaft and was able to read it from the BBB.
- Wrote a Java application for the Beagle Bone Black to control the speed of the treadmill over Ethernet. Bypassed the treadmill logic and connected straight to the motor driver.
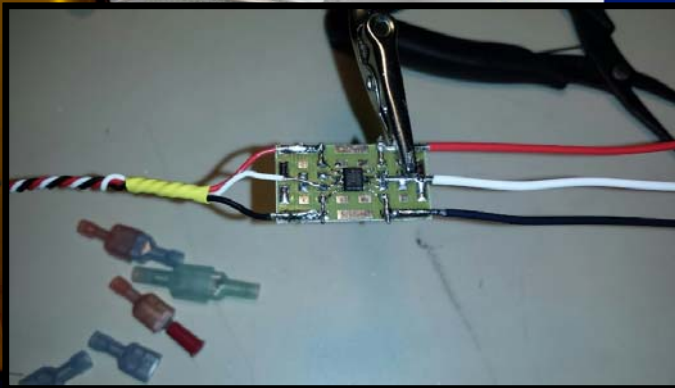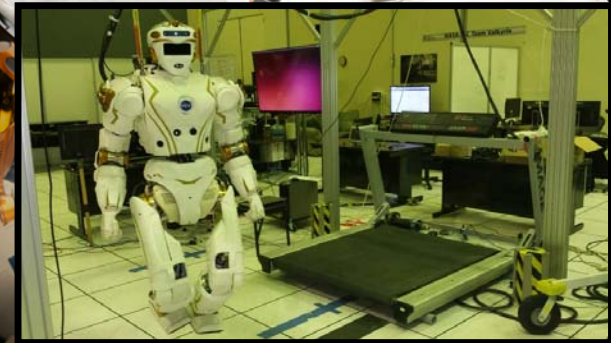
Battery Charge Monitor:

What was needed:
- Needed a way to interface with the embedded logic within the battery while it was charging.

What I had to do:
- Get familiarized with the battery control logic and the circuit schematics.
- Write Java libraries and C++ wrappers to interact with the Beagle Bone Black I2C port and the battery controllers.
- Wrote a java application to use the Beagle Bone Black to collect information from the battery controller while it was charging and relay it to a user later on.

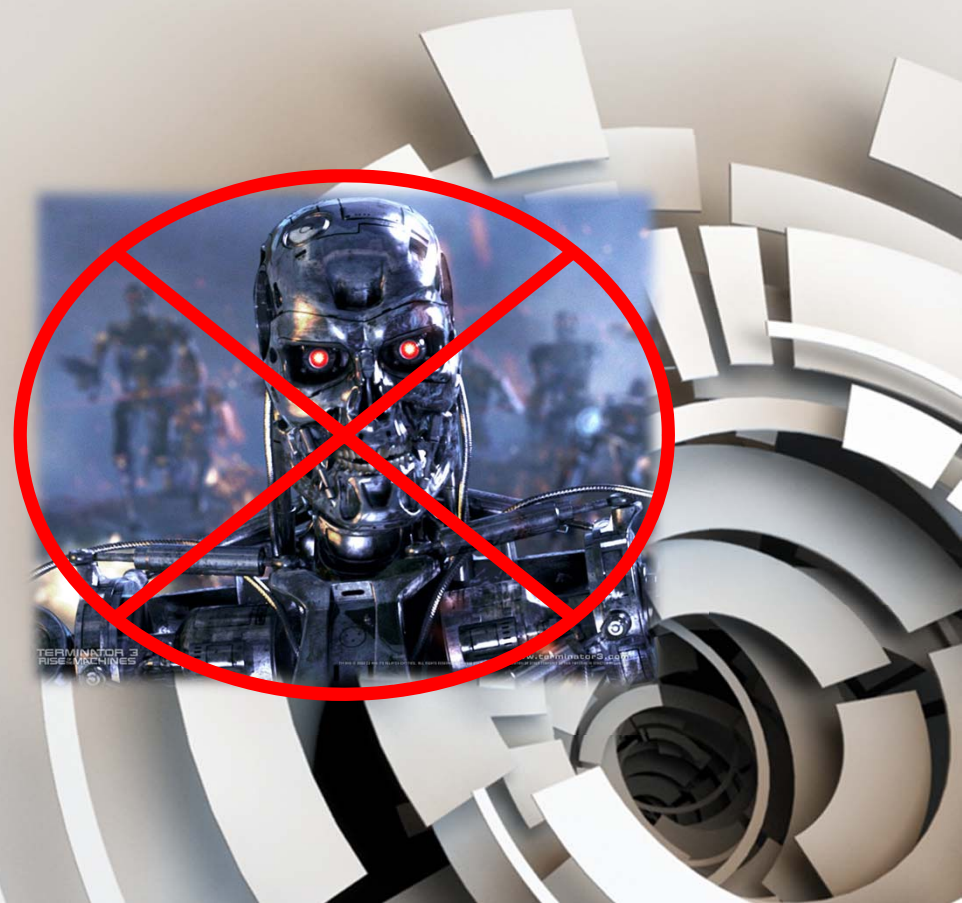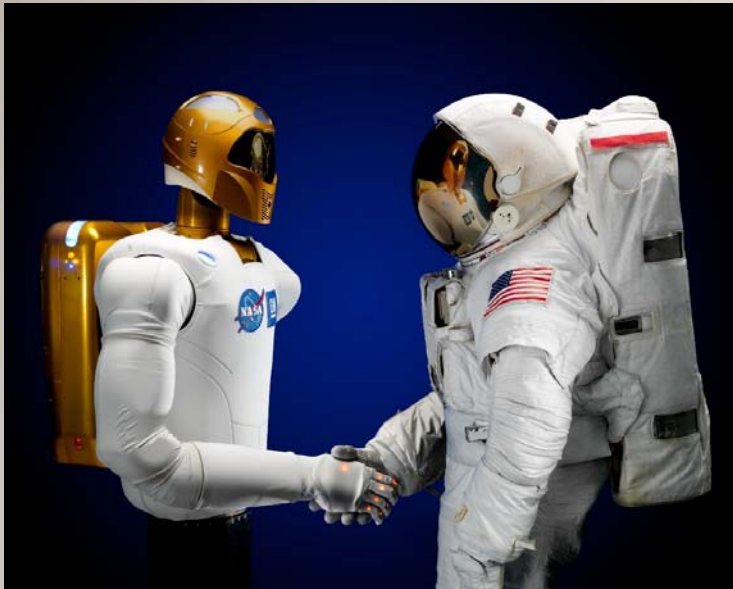# What is coming after NASA:

Back to school to work on that Masters.
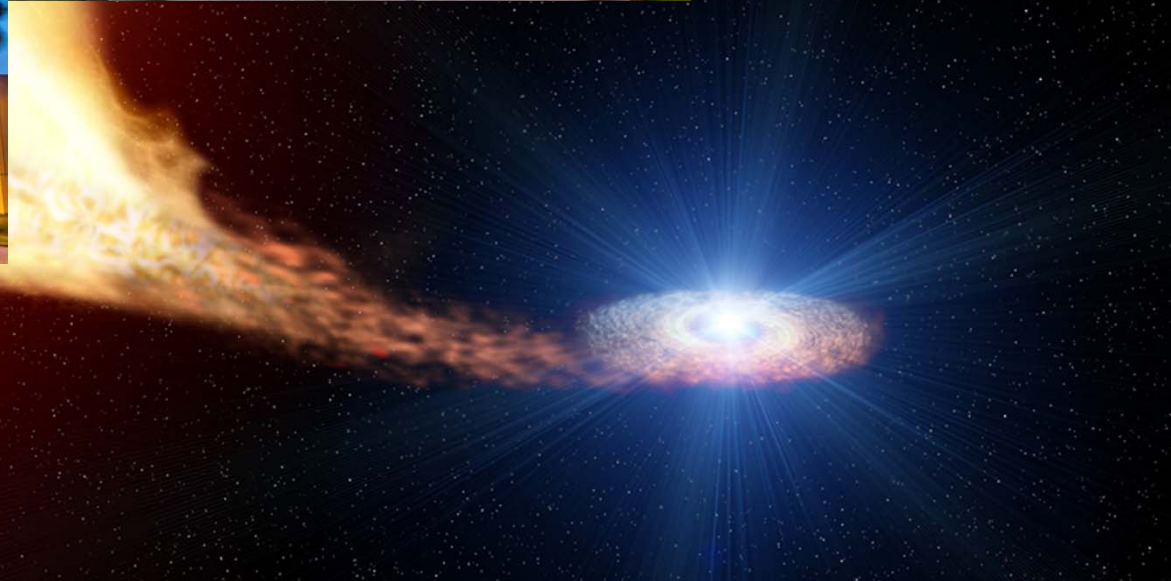
Further Down the Line

Back to NASA

AI no Terminator

Recap

- It has been a great tour.
- I have learned a lot.
- I have worked a lot.
- I have been involved in quite a bit of projects.
- Everyone has been awesome.

Special Thanks to:

NASA

- Edward (Eddie) Terrell
- Susan Beisert
- Pete Halvorson
- Kris Verdeyen
- Chad Tobler

Boeing

- Steve Gauvain
- Tom Mulder
- Cindy Olive
- David Mayhew
- John Wissinger
- Carla Ewart
- Andy Barreras
- Susan Aikawa
- Tom Wilson

And all the other I can't list because I wouldn't have enough space!!!!

For Real This Time ☺