HERMAN S. GREWAL

CURRICULUM VITAE

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MECHANICAL DESIGN ENGINEERING

View Summary Resume

- Diverse mechanical engineering experience in aerospace industry at Pratt & Whitney Canada
- Collaborated with global engineering team with proven oral & written communication
- Self-motivated problem solver with a meticulous attention to detail
- Experienced in fast paced environments to deliver on tight deadlines
- Managed multiple concurrent projects while comfortably switching contexts quickly
- Highly analytical with numerous awards for published research & academic excellence
- Calculated integration of mechanical, electrical & software engineering for innovative designs

TECHNICAL PROFICIENCIES

CAD:	CATIA V5, SolidWorks, CATIA CADAM, AutoCAD, Inventor
Analysis:	ANSYS, CATIA V5 Generative Structure Analysis, SolidWorks Simulation
Manufacturing:	GD&T, Tolerance Analysis, DFM/DFA, Machining, Tubing, Castings, 3D Printing, Injection Molding, Welding/Brazing, Sheet Metal Forming, Additive (SLS)
Project Management:	ENOVIA VPM, ENOVIA PLM, SharePoint, Git, Slack, Bitbucket
Software:	C, C++, MATLAB, Simulink, VBA, SQL
Hardware:	Arduino, Soldering, Oscilloscope, Sensor Selection/Integration

WORK EXPERIENCE

PRATT & WHITNEY CANADA, Mississauga, Ontario
Turbofan ECN (Externals, Controls & Nacelles) Design & Installation Department

Mechanical Designer Jul 2019 – Present

As a full-time designer, I own the design of complete modules on engine programs. I support all aspects of product design from initial conception to final production. I collaborate with many departments including Projects, Materials, Manufacturing, Advance Design, Drafting, Analytical Groups, Test, Development, Customer Service Engineering and Configuration Management as well as external suppliers and partners.

- Over 3000 hrs in **CATIA V5** modeling and drafting packages including several workbenches; Part Design, Assembly Design, Drafting, Generative Shape Design, Generative Sheetmetal Design, Tubing Design, DMU Navigator, DMU Space Analysis and Generative Structure Analysis
- Proficiency in **ENOVIA VPM & PLM** in version control, approval routes, BOM & change management
- Lead full design cycle from: Start up, 20% Review, Critical Design Review, 80% Review, Final Design Review
- Create **Design Layouts** to communicate design features, assembly instructions & BOM changes
- Manage **Digital Mock-Up (DMU)** for layout structures and ensure correct fits to overall engine assembly
- Lead Integrated Product Team (IPT) meetings and track action items to progress project
- Review and approve detail **production drawings** with completed design checklists
- Create **Mark Ups** for drawing and part revisions
- Perform **tolerance stackups** and define **GD&T** controls on drawing
- Evaluate design risks and formulate mitigation strategy with Projects Engineering
- Document project with complete design features and options in **Design Summary Memo (DSM)**
- Complete design verification with **Design for Assembly (DFA)** study, **tool accessibility** studies, **trial fits** and **Request for Test (RT)**
- Work with Projects to develop **Design Verification Plan (DVP)** and meet substantiation requirements
- Review **Market Feedback Analysis (MFA)** for legacy designs for improved reliability of new designs
- Conduct **trade studies** for design alternatives with regards to **Key Performance Indicators (KPI)**
- Work with Projects and Procurement to evaluate cost, lead time and risk for **manufacturing & material selection**
- Disposition **Quality Notifications (QN)** by reviewing part deviations for acceptability
- Collaborate with Accessory Designers and Accessory Suppliers to define component design requirements and evaluate supplier bids
- Work with **Suppliers** to review manufacturing limitations, optimize designs and reduce tooling costs
- Concurrently work on up to 7 projects, quickly switching focus from one to another as required
- Received multiple awards and distinctions for my work

Notable Projects:

Module Owner for New Engine Program for Fuel and Air Systems

- Complete design responsibility for both modules on engine program for **development and production**
- Design rigid **tubing**, custom fittings and **sheetmetal support brackets** for fuel and air system
- Adapt to rapidly changing and ambiguous design requirements
- Work to very ambitious **schedule** to meet development program timeline while mitigating risks

- Collaborate with tubing supplier to optimize orbital welding process for reduced **tooling costs**
- Present **trade studies** with alternative materials for cost, weight, manufacturing challenges and lead times
- Iterate on designs with **Dynamics and Structures** to meet life requirements
- Coordinate with other modules for mating features and fits
- Analyze installation of Line Replaceable Units (LRU) for accessibility and mechanic time
- Work with Accessory designers and supplier to define design features, installation procedure and tolerances
- Example accessories include Fuel Oil Heat Exchanger, Variable Guide Vane Actuator, Flow Divider Valve, Fuel Metering Unit, Pressure Sensor

PW800 Development Vibration Sensor Bracket

- Ch. A and Ch. B vibration sensors experiencing mismatch in field causing safety issue
- Suspected to be caused by cantilevering of Ch. B sensor over flange on shared bracket
- New design could not affect production harness and fit in aircraft nacelle
- Rapidly designed 2 alternative brackets to reduce mismatch
- Brackets machined and **tested** in house with positive results for "stacked" design
- Fundamental mode of bracket in engine running range, required further testing
- Developed **substantiation plan** with field testing
- Define GD&T controls and **coating specifications** on drawing
- Released production drawings and successfully closed project with quick turnaround

Exhaust Gas Temp. (EGT) Sensor System Design for New Engine Program

- Baseline design set to measure Turbine Temperature, but temperature sensor quotes exceeded 10X projected cost due to temperature environment and life requirements
- Tasked to design alternative EGT system with **sensor design** and **harness routing**
- Reviewed existing legacy temperature sensors for reliability and cost
- Collaborated with Accessory Design, Performance Aero and Controls to determine new design requirements
- Develop envelope and prelim design for supplier bidding
- Evaluated supplier bids against installation, harness routing and performance requirements

PW800 Development Harness Support Bracket and Routing

- Production design for harness support brackets requires complex designs, compatible for both left hand and right hand engines
- Due to lead time issues, tasked to design development support brackets relying solely on simple **press-brake** designs and standard brackets
- Oversaw **development build** and provided alternative options on engine

PW307 IPPS Design

- Oversee designs developed by subcontracted design company
- Review **engineering changes** and approve production **drawing revisions**
- Ensure designs meet **Best Practices (BP)** and conduct review meetings
- Create substantiation plan with Projects and seek Customer concurrence

PRATT & WHITNEY CANADA, Mississauga, Ontario
ECN (Externals, Controls & Nacelles) Design/Drafting Department

Mechanical Designer [Co-op] Jan 2018 – Aug 2018

In the engineering hub of Design/Drafting, I collaborated with many departments including Projects, Detail Design, Materials, Manufacturing and Configuration Management. I gained a full spectrum exposure to product design from initial conception to final production. I have become skilled in managing and switching between multiple projects. Overall, I worked on 30+ projects while releasing 70+ drawings and models.

- Drafted 2D engineering drawings and 3D models for using **CATIA V5** using Drafting Room Manual (DRM) standards and P&WC best practices **[AYME Y14.5-2009]**
- Utilize **ENOVIA VPM & PLM** in version control, approval routes, BOM & change management
- Developed understanding for various **manufacturing processes**: castings, forgings, machined, sheet metal forming, injection molded, 3D printed, additive (SLS)
- Developed meticulous attention to detail while drafting large (40+ sheet) drawings and assemblies including clearance inspection, standards review, checklist completion, documentation consultation
- Participate in international **design review meetings** with suppliers and partners
- Experienced with Design for: Assembly (**DFA**), Manufacturing (**DFM**), Cost (**DFC**), Test, Environment
- Created Note Form Drawings (NFD) and Supplier Furnished Information (SFI) models for **supplier parts**
- Created production standard models/drawings while applying **GD&T** and conducting **tolerance stack ups**
- Prepared SPD (Supplementary product data) / SMD (Supplementary Material data) sheets conforming to the Design layout, Material Engineering and related drafting documents
- Utilized parametric modelling for standard and tabulated parts
- Worked on up to 5 projects concurrently, quickly switching focus from one to another
- Provide support to Projects for projected timeline and resource allocations
- Self-motivated to track and coordinate signature requirements from key departments to release parts
- Completed extensive training courses including intellectual property & export classification

Notable Projects:

- Completed Interface Control Document (ICD) drawings with complex 10+ part axial & radial **stack ups** for coordinating part design and assemblies from multiple partners
- Designed new injection molded composite clamps to replace machined aluminum clamps, applied new drawing notes and controls, investigated cost & weight savings, conducted **FEA** in **ANSYS** with Static Structures to validate design, wrote **Design Summary Memo** (DSM)
- Worked on **testing** project with redesigned **experimental** bearing housing for reduced vibrations; drafted models and drawings for multiple parts, conducted axial tolerance stack up, designed mating features for assembly, coordinated interference/clearance fits
- Designed new **additive manufacturing** (laser powder bed fusion) brackets to replace sheet metal formed brackets, iterative designs improved for **dynamic and static stresses**, validated designs for manufacturability and installation

PRATT & WHITNEY CANADA, Mississauga, Ontario
Large Turbofan Engine Product Definition Department

Technical Publications Analyst [Co-op] Apr 2017 – Aug 2017

Working in this department, I gained exposure to a fast paced, heavy workload environment. I adapted quickly to deliver on tight deadlines. I collaborated and verified work from global offshore team and partner organizations. I developed strong communication skills and a results driven attitude. I developed a technical understanding of aftermarket and configuration management processes. In the end, I completed 88 SBs, inspected 200+ offshore team documents and created 100+ IPC illustrations.

- Created exploded assembly illustrations using **CATIA V5** and **Auto-Trol Tech Illustrator** software for Service Bulletins (SB) and Illustrated Parts Catalogues (IPC)
- Annotated graphics for technical writers using **S1000D** standards and industry best practices
- Utilized ENOVIA PLM system for searching engineering documents and inspecting 3000+ part **BOMs**
- Inspected work and communicated markups to Accenture team in India using **SharePoint**
- Frequently visited shop floor to inspect parts and validate assembly procedures
- Skilled at reading 30+ sheet engine cross section drawings and Assembly Floor Sheet (AFS) drawings
- Developed understanding for P&WC **Change Management** objects (CO, CR, CA, classifications & codes)
- Developed understanding of aftermarket organization processes including overhaul & maintenance
- Coordinated with P&WC **suppliers and partners** to resolve issues quickly
- Delivered results for strict deadlines through job tracking and efficient time management

PRATT & WHITNEY CANADA, Mississauga, Ontario
Compressor Design/Drafting Department

Mechanical Designer [Co-op] Sep 2016 – Dec 2016

In my first design role, I learned about the drafting standards and design processes. I gained exposure to practical difficulties in designing parts including cost and manufacturability. As part of the compressor module, I worked on highly controlled and complex parts. Overall, I worked on 10+ projects and released 20+ models and drawings.

- Performed routine 3D model and drawing revisions as required using **CATIA V5**
- Worked on PW800 compressor components: disks, rotors, stators, critical assemblies, fan
- Worked with Static Structures to build models for analysis in **ANSYS**
- Utilized **ENOVIA VPM** for version control of CAD files & creating Product Structure Network (PSN)
- Validated and secured 3D compressor airfoil models in collaboration with Aerodynamics group
- Revised legacy drawings using **CATIA CADAM**
- Created 10 new critical compressor disc and hub models and drawings while revising all affected assemblies to reflect new **environmental** design requirements

Highlight Project: Integrated Bladed Rotor (IBR) Cost Optimization

- Worked to reduce manufacturing steps for flash welded IBR
- Reduced inspection costs by modifying design features and applying **GD&T**
- **Presented** design alternatives to Design groups using input from Manufacturing and Quality groups

PRATT & WHITNEY CANADA, Mississauga, Ontario
Advance Concepts Architecture & Mass Properties Department

Weights Analyst [Co-op] Jan 2016 – Apr 2016

As an analytical position, I worked as part of a large engineering team providing detailed results to Design.

- Performed weight analysis of engine parts and assemblies for **Engineering Change** (EC) reports
- Conducted rotor burst analysis for critical rotating parts per FAA standards and P&WC best practices
- Calculated inertia values for rotor balance assemblies
- Validated mass properties & material specifications for new parts
- Provided software development support to **ENOVIA PLM** team working on customized applications

PRATT & WHITNEY CANADA, Mississauga, Ontario
Advance Concepts Architecture & Mass Properties Department

Weights Analyst (Special Project) [Co-op] May 2015 – Aug 2015

My first position focused around my 4 month long project. I learned about big company procedures in the highly regulated industry of aerospace. I worked hard to deliver a meaningful tool and the resulting analysis. My project proved successful in the original intent and received high praise for the detailed analysis.

- Completed a 40 hour **CATIA V5** Fundamentals course by Mecanica Solutions
- Completed Hands-on PW308 Gas Turbine Engine Assembly Course

Highlight Project: Manufacturing Scatter Analysis Tool

- Investigated manufacturing scatter for 6 production engine programs
- Analyzed EC reports to normalize large raw engine weight data sets
- Performed detailed statistical analysis and risk models using **Six Sigma** methodology
- Coded custom macros in **VBA** (MS Excel) for robust data collection and analysis
- Created detailed instruction manual for use and troubleshooting developed tool
- Drafted work term report on tool development based on **Waterfall model**
- Presented scatter analysis results to Advance Design for reviewing customer commitments

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EDUCATION

Candidate for Masters of Engineering in Mechanical Engineering
UNIVERSITY OF WATERLOO — Waterloo, Ontario

Pursued on part-time basis while working full-time, expected August 2021

Bachelor of Applied Science in Mechatronics Engineering (Co-op)
UNIVERSITY OF WATERLOO — Waterloo, Ontario

Graduated June 2019

GPA: 3.93/4.00
Dean's Honour List
Academically Ranked in Top 10% of Class

RESEARCH EXPERIENCE

UNIVERSITY OF WATERLOO, Waterloo, Ontario
Vision & Image Processing (VIP) Lab

Prostate Cancer Research Sep 2016 – Apr 2017

- Developed graphic user interface using **MATLAB GUIDE**
- Processed raw MRI images to dynamically execute multiple cancer analysis algorithms
- Received President's Research Award

UNIVERSITY OF WATERLOO, Waterloo, Ontario
Vision & Image Processing (VIP) Lab

Lung Cancer Image Research Sep 2016 – Apr 2017

- **Abstract publication:** Imaging Network Ontario Symposium 2016, *"Single-Click Lung Nodule Contouring Method Using a Hierarchical Conditional Random Field"*
- Developed polar coordinate system based edge detection algorithm
- Utilized **MATLAB** to process raw CT scan images, test algorithm and extract key statistical features
- New algorithm performed the same or better than established algorithms (Region Growing & Intelligent Scissors) in Sensitivity, Specificity, Accuracy, Dice and Jaccard
- Completed in collaboration with Sunnybrook Research Institute in Toronto, ON
- Received President's Research Award

PROJECT PORTFOLIO

Capstone Project: Inspeksi Sep 2018 – Mar 2019

- Acted as **mechanical lead** and **project manager** for AUV project
- Created a surface defect detection system using deep-learning algorithm
- Developed 4 DOF robotic arm with back driveability for customized scanning
- Created data set using different product shapes, materials and colours
- Validated functionality using defective parts from Ecobee manufacturing plant
- Awarded Autodesk Capstone Award

Autonomous Underwater Vehicle (AUV) Sep 2017 – Dec 2017

- Acted as **mechanical lead** and **project manager** for AUV project
- Designed PVC pipe frame, 3D printed propeller covers, sensor supports and motor mounts
- Created CAD models for parts and assemblies in **SolidWorks**
- Analyzed hydrodynamics for prop covers in **ANSYS AIM**
- Conducted simulated and empirical testing to verify and compare design alternatives
- Performed sensor selection and testing for ultrasonic, IMU & light sensors
- Utilized diverse tools including drill press, Dremel tool, 3D printer, soldering iron & oscilloscope
- Experimented with many joining and sealing methods including marine weld, epoxy & bolts
- Coordinated with electrical and software team members to streamline product **integration**
- Developed responsibility chart, **budget** and **project schedule** using Gantt chart

Audio Player Feb 2017 – Mar 2017

- Programmed audio player in **C** using **FPGA** board
- Utilized SD card to read audio file in chunks to write data to stereo buffers
- Designed user friendly design with multiple button functionality using interrupts
- Built using multiple programs including Altera Toolchain, QSYS, Quartus and NIOS build tools

Line Following Robot May 2016 – Aug 2016

- Programmed and constructed line following robot on custom **PCB** board
- Characterized motors and constructed light sensors using IR LEDs and photodiodes
- Utilized **oscilloscope** to test and verify hardware
- Integrated **sensors** including optical encoders, thermistors and Hall Effect sensors
- Calculated values for circuits and soldered components

Bridge Design Apr 2016 – Jul 2016

- Created simplified 2D finite element solver in **MATLAB** for rapid design evaluations
- Conducted extensive testing on balsa wood sample to empirically determine material parameters
- Performed **FEA** on truss elements using **ANSYS AIM** and **SolidWorks** models
- Utilized power tools for **rapid prototyping** and laser cut final bridge parts
- Planned and performed physical stress tests to evaluate prototype designs
- Presented final bridge design with justification of design choices in symposium

Maestro (Hand Motion Controlled Robot) Oct 2015 – Nov 2015

- Worked with team for Deloitte Tech Exchange (DTEX) competition
- Utilized LeapAPI and **Python** to map hand gestures from Leap Motion Controller
- Integrated with **ROS** to test using robot simulations in Gazebo
- Team placed 1st in competition

Temperature Sensor Design Nov 2015

- Utilized thermistor for raw temperature readings
- Processed data and calibrated sensor using **Arduino** to achieve 1°C accuracy
- Developed interface with buttons and LED display for increased functionality
- Accomplished in projected timeline with desired design specs

Midnight Project (Symptom Tracker and Analysis) Sep 2015

- Designed **GUI** for multiple sclerosis patient survey of symptoms rated from 1 -10
- Developed relational database to store data using user friendly features coded in **SQL**
- Performed **statistical analysis** to detect negative trends in symptoms
- Coded macro in **VBA** to automatically send warning emails to family members/caretakers
- Finalist at Hack4Health competition

Gumball Sorting Robot Oct 2014 – Nov 2014

- Designed and constructed structurally sound robot to sort gumballs by colour
- Integrated multiple **sensors** and motors to isolate, inspect and place gumballs
- Programmed and tested software coded in **C**
- Displayed efficiency rate, time elapsed and any error messages

AWARDS & SCHOLARSHIPS

UNIVERSITY OF WATERLOO, Waterloo, Ontario
Dean's Honour List Jun 2019

- Graduated with distinction for academically ranking in the top ten percent of class

UNIVERSITY OF WATERLOO, Waterloo, Ontario
Autodesk Capstone Award Apr 2019

- Received distinction for 4th year capstone project

UNIVERSITY OF WATERLOO, Waterloo, Ontario
Richard Matzeg Memorial Scholarship Oct 2017

- Received scholarship for demonstrated leadership & academic achievements

UNIVERSITY OF WATERLOO, Waterloo, Ontario
President's Research Award May 2016, Sep 2015

- Received award for cancer research conducted with the Vision & Image Processing lab

PROFESSIONAL ENGINEERS ONTARIO (PEO), Brampton, Ontario
Aspiring Engineer Scholarship Jan 2015

- Received scholarship from distinguished PEO organization for demonstrated leadership, community involvement & academic achievements

UNIVERSITY OF WATERLOO, Waterloo, Ontario
President's Scholarship of Distinction Aug 2014

- Received entrance scholarship for 95%+ admission average from high school

ROYAL CANADIAN AIR CADETS, Caledon, Ontario
Air Cadets Long Service Medal Oct 2013

- Received for six years of active involvement in the Air Cadets organization as a Flight Sergeant, instructor & flight commander