John Vandermeulen

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US Citizen

Education

Clemson University Clemson, SC
Bachelor of Science in Mechanical Engineering, Minor in Mathematical Sciences December 2025
Master of Science in Mechanical Engineering (Thermal and Fluid Sciences) December 2026
GPA: 3.48/4.00

Work Experience

Gulfstream Aerospace Corporation Savannah, GA
Vendor Project Engineering Co-op May 2025-August 2025

- Developed and executed DO-160 compliant test plans for vendor-supplied aircraft components, including the design of custom test fixtures using CATIA
- Authored 28 technical supplemental reports to support airworthiness of vendor parts
- Completed over 20 hours of continuous improvement training, earning Yellow Belt certification

Stress Engineer Co-op Aug 2024-Dec 2024

- Verified structural compliance of 14 custom G700 interior components with FAA Part 25 regulations by coordinating with design engineers and FAA representatives
- Performed conservative stress analysis and hand calculations to validate new designs against existing stress reports
- Generated new FEMAP based stress analyses and FAA approved reports, supported by Excel VBA automation

Baseline Design Engineer Co-op Jan 2024-Apr 2024

- Completed an intensive, 40-hour advanced CATIA training program
- Designed 37 new workflows including new custom interior asset designs as well as amendments to old engineering using CATIA, AutoCAD, and PLM software Enovia SmarTeam
- Worked on long term project to design a new standard interior asset for the G700 program using Catia, Kaizen walks, and weekly presentations with management

Skills

- CAD & FEA: CATIA, SolidWorks, AutoCAD, FEMAP
- Aero & Thermal Tools: XFOIL
- Programming: MATLAB, VBA
- Software and PLM: Excel, Word, PowerPoint, ENOVIA SmarTeam

Specialized Projects

- Composite Layup Optimization: Laminate Theory, Tsai-Wu Failure, MATLAB Automation
- Turbojet Engine Optimization: Cycle Analysis, Compressor/Turbine Matching
- Heat Transfer Tool & Steam Engine Design: Thermal Modeling and Mechanical Analysis
- Vacuum Bin Optimization: Suction Performance Modeling, Pressure-Area Scaling
- Aircraft Design Project: Aerodynamics, Performance, and Stability Sizing

Dear Hiring Manager,

I am a Mechanical Engineering graduate from Clemson University, having completed my Bachelor of Science in Mechanical Engineering in December 2025. I am currently pursuing a Master of Science in Mechanical Engineering through Clemson's BS/MS program, with a specialization in Thermal and Fluid Sciences and a projected graduation in December 2026. I am seeking engineering roles focused on propulsion systems, thermal-fluid analysis, or aerodynamic performance, where I can apply both advanced coursework and hands-on aerospace industry experience.

Through my academic work, I have developed a strong foundation in propulsion, compressible flow, and heat transfer. My recent projects include the optimization of a turbojet engine cycle using Brayton cycle analysis, compressible flow relations, and MATLAB-based iterative modeling to optimize compressor ratios and afterburner performance. Additional work in composite layup optimization using laminate theory and Tsai-Wu failure criteria, along with aerodynamic analysis using XFOIL, has strengthened my ability to translate theory into quantitative engineering results.

I have also completed three cooperative education rotations at Gulfstream Aerospace Corporation, gaining experience in a highly regulated aerospace environment. My roles spanned vendor project engineering, stress analysis, and baseline design for the G700 program. During these rotations, I developed DO-160 compliant test plans, produced airworthiness documentation, performed structural analyses under FAA Part 25 regulations, and supported design efforts using CATIA and AutoCAD. These experiences strengthened my technical rigor, attention to certification requirements, and ability to communicate engineering results within multidisciplinary teams.

I am motivated to contribute to technically challenging aerospace programs and to continue developing expertise in propulsion, thermal-fluid systems, and aerodynamic performance. I would welcome the opportunity to discuss how my academic focus and industry experience could support your team's engineering objectives.

Thank you for your time and consideration.

Sincerely,
John Vandermeulen

Turbojet Performance Optimization & Afterburner Analysis

Compressible Flow | Clemson University

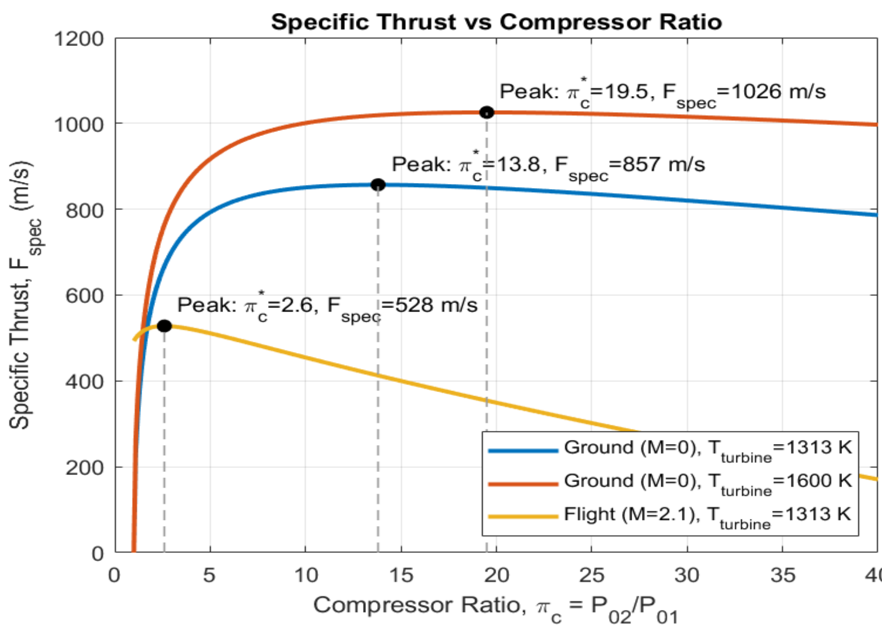
Problem

Determine compressor ratio that maximizes specific thrust for an ideal turbojet under ground and supersonic flight conditions given various turbine inlet temperatures. Evaluate afterburner temperature needed to increase thrust beyond dry operating point.

Method

A parametric MATLAB model of an ideal turbojet engine was developed using compressible flow and Brayton cycle relations. Specific thrust was calculated for a wide range of compressor ratios to identify optimal operating point. Afterburner analysis was conducted by solving for the heat input required to increase thrust from 55kN to 70kN.

Results



Metric:	Ground (M=0) $T_{turbine}$=1313K	Ground (M=0) $T_{turbine}$=1600K	Flight (M=2.1) $T_{turbine}$=1313K
Optimal Compressor Ratio (π_C^*)	13.8	19.5	2.6
Max Specific Thrust (F_{spec}) [m/s]	856.91	1025.6	527.95
Mass Flow for 55kN Thrust ($\dot{m}$) [kg/s]	64.184	53.625	104.18
Afterburner Temp for 70kN Thrust (T_{AB}) [K]	1596.8	1957.4	1501.8

- Clear maximum specific thrust identified as a function of compressor ratio.
- Improving combustor performance increased maximum specific thrust and optimal compressor ratio.
- Supersonic flight conditions reduced maximum specific thrust due to inlet effects.
- At optimal compressor ratios, afterburner operation requires significant heat input to increase thrust, increasing with turbine inlet temperatures but decreasing during supersonic flight.

Supersonic Inlet Shock Optimization for Turbojet Design

Compressible Flow | Clemson University

Problem

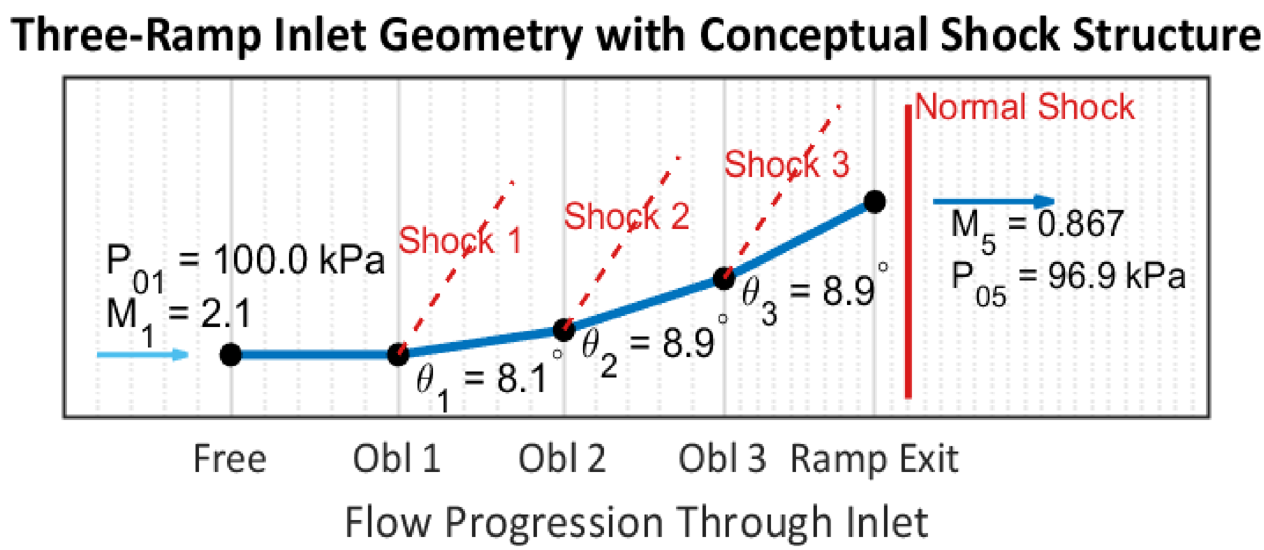
Design and optimize a three-ramp supersonic inlet to maximize stagnation pressure recovery for a turbojet operating at supersonic flight conditions. Determine the optimal sequence of oblique shocks followed by a terminal normal shock to decelerate the incoming airflow to subsonic speeds and minimize total pressure losses entering the engine.

Method

Reusable MATLAB functions were created to find the Mach number change and stagnation pressure loss across each oblique and normal shock using compressible flow theory. An inlet with 3 oblique shocks and 1 terminating normal shock was modeled by using a MATLAB code to sweep across different combinations of ramp deflection angles and using the functions to find exit Mach number and stagnation pressure.

The optimal inlet geometry was identified by maximizing the exit stagnation pressure. The resulting ramp geometry was visualized using a schematic inlet diagram to show the flow deflection and deceleration at the inlet.

Results



- The optimal inlet geometry minimizing stagnation pressure loss at a flight speed of Mach 2.1 was identified as a series of wedges that deflect the airflow by 8.1˚, 8.9˚, then 8.9˚.
- The three oblique shocks progressively reduce the freestream Mach number while preserving stagnation pressure prior to the terminal normal shock which decelerates the flow to subsonic speeds.
- This shows that a series of oblique shocks at small angles offers a more efficient inlet geometry for a supersonic engine than a single oblique or normal shock.
- For comparison, a single normal shock at Mach 2.1 reduces stagnation pressure to 67.4 kPa, resulting in reduced turbine power, lower nozzle exit velocity, and overall lower thrust provided by the engine.
- This optimized inlet produces a subsonic flow suitable for turbojet operation and significantly improves total pressure recovery.

Alternative Wing Design for CESSNA 152

Aerodynamics | Clemson University

Problem

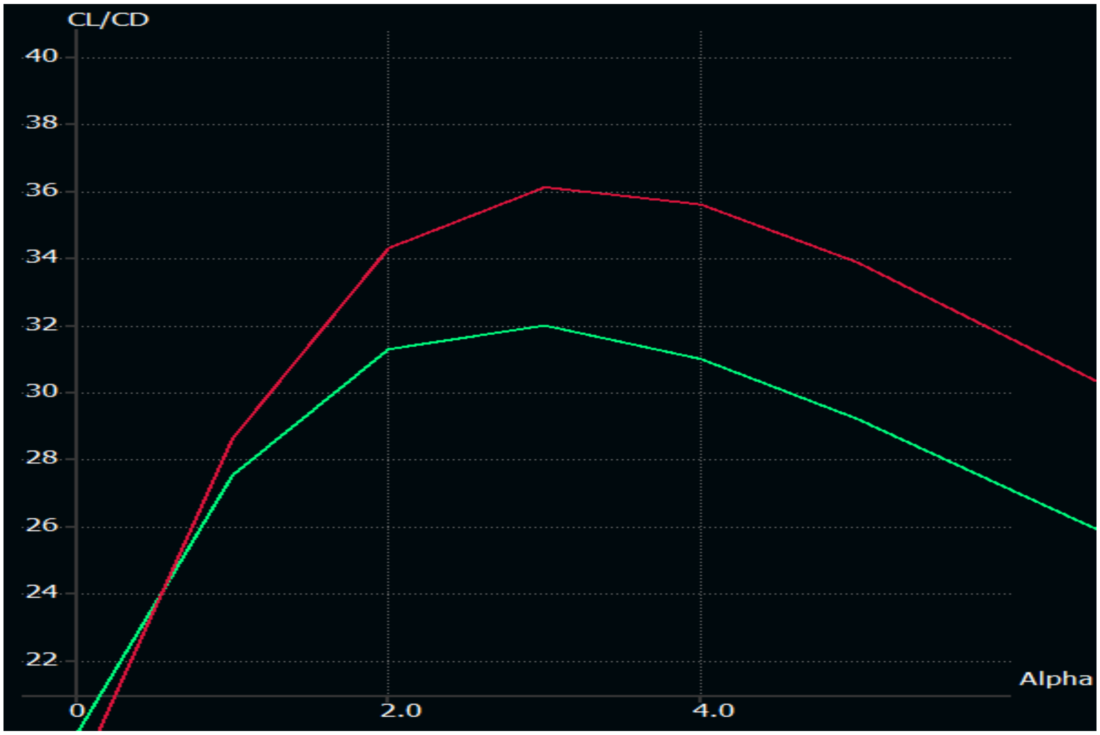
Improve the maximum lift to drag ratio of the Cessna 152 wing by 10% at low-speed cruise conditions while holding to project constraints. The wing must maintain the same airfoils as the original at the root (NACA 2412) and the tip (NACA 0012). The wing area cannot change by more than 5%. The root chord must remain the same as the original wing and the tip chord must remain at least 1 meter in length.

Method

The original Cessna 152 wing was modeled in XFLR5 and analyzed using a three-dimensional vortex-lattice method to establish reference lift and drag performance at the desired conditions. Based on classical parabolic drag polar theory, maximum lift-to-drag ratio increases with aspect ratio due to the reduction in induced drag. This means larger wing spans are associated with higher maximum lift-to-drag ratios.

Using this relationship, a simplex method was implemented to maximize wingspan while constraining wing area within upper and lower bounds and enforcing a minimum tip chord of 1 meter. The resulting wing geometry was then modeled in XFLR5 and analyzed under the same conditions as the original design for direct performance comparison.

Results



Lift-to-drag vs angle of attack for original design and improved design

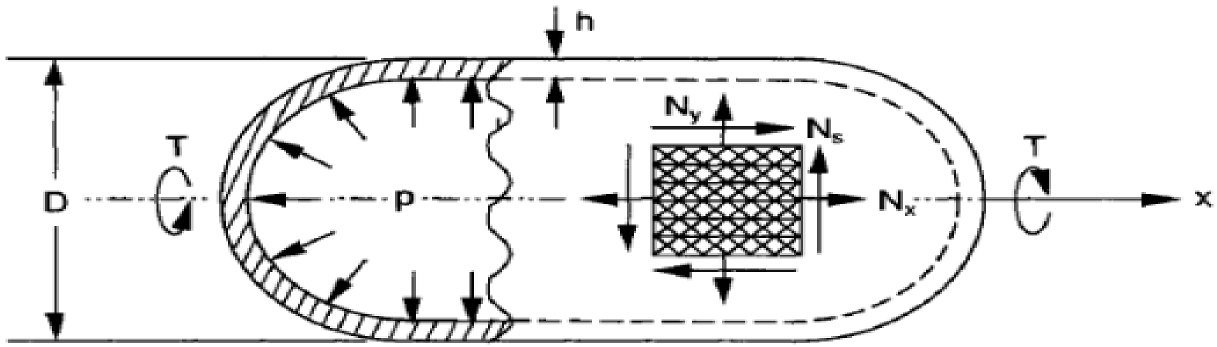
- The optimized wing design exceeded the required performance, offering a 12.8% increase in maximum lift to drag from 32 to 36.1.
- All constraints were met. The final wing area was 15.556 square meters, a 4.97% increase in area from the original 14.82 square meters, meeting the wing area constraint.
- Final wing geometry was modeled in SolidWorks and 3D printed for visualization and fit verification.

Design of Composite Pressure Vessel

Composites | Clemson University

Problem

Design a thin-walled cylindrical pressure vessel subjected to internal pressure and torque loading. Optimize a carbon/fiber epoxy laminate with the design space of $[90/(\pm 45)_m]_{ns}$ to minimize wall thickness while maintaining a Tsai-Wu safety factor of at least 2. Compare this design with a reference aluminum vessel based on the von Mises criterion and the same design factor.



Method

Classical Laminate Theory and Tsai-Wu failure criterion was used to develop a MATLAB optimization tool that can evaluate laminates in the design space of $[90/(\pm 45)_m]_{ns}$. The tool computed in-plane resultant loads from internal pressure and torque. Symmetric laminate layups were then generated, and the corresponding laminate stiffness matrices and mid-plane strains were calculated using CLT.

Finally, the tool calculated Tsai-Wu safety factor of each ply within each laminate by using ply-level strains computed from Classical Laminate Theory. The minimum Tsai-Wu safety factor among the plies was recorded for the laminate safety factors. The thinnest laminate meeting the desired Tsai-Wu factor of 2 was selected as the optimal design.

A reference aluminum pressure vessel was analyzed using thin-walled stress relations and the von Mises criterion under the same design factor of 2. This provided a baseline to evaluate weight savings and thickness comparison.

Results

Optimal Layup Structure	Number of Plies	Laminate Thickness (mm)	Tsai-Wu Safety Factor
$[90/(\pm 45)_1]_{6s}$	36	4.572	2.01
Longitudinal Modulus ($\bar{E}_x$) [GPa]	Transverse Modulus ($\bar{E}_y$) [GPa]	Shear Modulus (G_{xy}) [GPa]	Composite Weight Compared to Aluminum Vessel
28.57	65.54	27.75	69.23%

- An optimal layup of $[90/(\pm 45)_1]_{6s}$ was identified as the minimum thickness design satisfying the Tsai-Wu safety factor requirement.
- The optimized pressure vessel achieved a Tsai-Wu safety factor of 2.01, meeting the design constraint.
- The minimal required wall thickness of the optimal design was found to be 4.572 mm and consisted of 36 plies, demonstrating an efficient balance between strength and manufacturability.
- Optimal vessel design offered 30.77% weight savings compared to Aluminum Vessel.

Ryobi Stick Vacuum Bin Solution

Senior Capstone Design | Clemson University

Problem

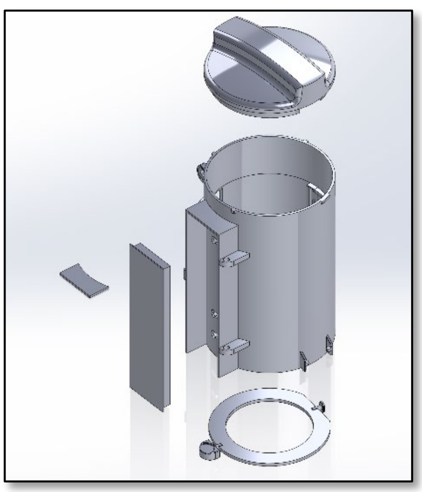
Consumer feedback for the Ryobi ONE + HP Advanced Stick Vacuum identified two major issues: suction loss due to hair wrapping around the internal pre-filter, and inefficient debris packing that limited usable bin volume. The objective of this senior capstone project was to design a mechanical solution that quickly cleans the pre-filter and packs debris tighter to increase storage capacity.

Method

A structured engineering design approach was followed. Market research, customer surveys, a Quality Function Deployment (QFD), and a Requirements Traceability Matrix were all used to define customer requirements. These customer requirements were refined into quantifiable technical requirements: the solution to the design problem could not have a reduced suction performance, must meet safety standards, not add excessive weight or parts, and must be within a selected budget per unit.

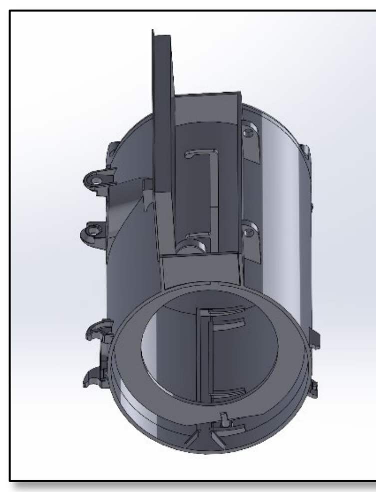
Multiple concepts were generated using a 6-3-5 method, collaborative sketching, and a Pugh matrix to select the final design which was developed using SolidWorks and 3d printed. Performance validation was conducted through suction testing, debris compaction testing, and hair removal testing. Safety standard tests, a manufacturing analysis, and other checks were used to verify the other technical requirements.

Results



Exploded View

Cross-Sectional View



Bottom View

- A mechanical sliding disc with a bolt action locking mechanism was created to clean the pre-filter while compacting debris within the dustbin.
- Hair removal test confirmed 96.7% of hair removed from the pre-filter. Debris compaction test revealed 80% increase in dustbin volume after engaging mechanism.
- During suction testing, the prototype exhibited a 14.76% increase in suction performance compared to the baseline vacuum configuration.
- The final prototype met all customer and technical requirements along with a strong business case of a manufacturable solution suitable for further refinement.

Block Change: Galley Tower Standardization

Baseline Design Engineering Co-op | Gulfstream Aerospace Corporation

Problem

Custom galley configurations on Gulfstream aircraft caused many unique galley tower assemblies which housed beverage appliances and miscellaneous storage. This variability resulted in redundant engineering, increasing workload, certification effort, manufacturing cost, and aircraft build time.

The objective of the Block Change project was to standardize galley tower designs across multiple aircraft and programs while mainlining compatibility with multiple galley configurations.

Gulfstream Galley with Tower Identified – Gulfstream Website

Method

An investigation of existing galley configurations was conducted to identify redundancy and reusability across platforms. By grouping towers by function, 3 categories were identified: beverage maker storage compartments, Commercial Off the Shelf (COTS), and miscellaneous storage.

A standard tower was designed to house each of the 3 function categories identified. Design updates were created using CATIA and managed through SMARTEAM. Design efforts focused on manufacturability, installation compatibility, and simplicity. Several techniques were employed to drive design decisions. Talking to floor technicians, attending kaizen walks, and communicating with subject matter experts allowed informed design decisions to be made. The key design modifications included a redesign of the tower door mechanism to improve structural stability and ease of access, addition of potted inserts and plumbing holes to support beverage appliance, reorientation of access panels to eliminate interference, and development of modular modification packages for each function category.

Results

- Provided data on galley configuration re-use rate.
- Reduced number of unique galley tower assemblies and increased baseline reusability across aircraft programs.
- Reduced engineering effort and certification timelines for future aircraft configurations.
- Lowered manufacturing cost and reduced aircraft build time.
- Improved installation stability and accessibility for galley components.

Stress Analysis: Interior Load Substantiation

G700 Stress Co-op | Gulfstream Aerospace Corporation

Problem

A sales-driven configuration update to the stateroom grouping required increasing storage loads under stateroom bed. Existing documentation and analysis for certification only covered prior load level. To ensure compliance with FAA Part 25 regulations, the current documentation had to be revised by updating the finite element model, re-running required emergency landing load cases, and confirming positive margins of safety using approved allowables and stress criteria.

Method

The FEMAP model in the existing documentation was updated by revising weight elements, meshing new brackets, and applying conservative emergency landing loads. To ensure safety, conservative assumptions were made during modeling such as treating strapped down items as free weights and selecting most critical brackets as the attachment method. When running the FEMAP analysis, emergency landing was assumed, which applies high acceleration in different directions for each case, including forward, aft, upward, downward, and sideward directions.

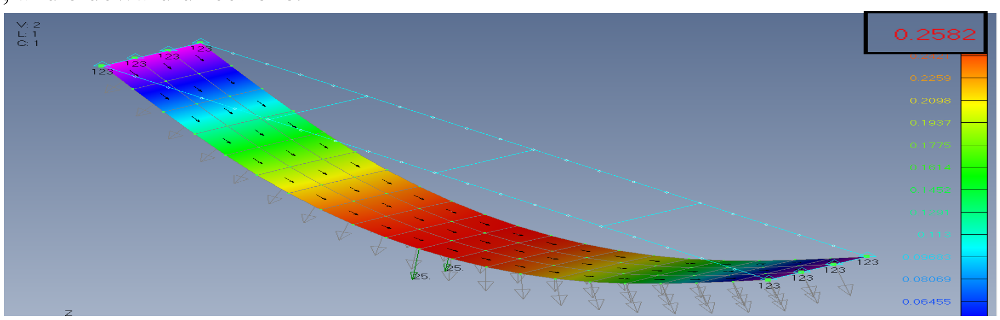


Image of FEMAP deflection study performed independently, images of analysis not included to protect Gulfstream proprietary information.

After FEMAP processing, results were verified using several post-processing methods. An automated Post-Processing Spreadsheet (APS) pulled FEMAP results and computed safety margins. In cases of negative margins of safety, certain accepted engineering strategies were used. In cases of in plane bending on honeycomb panels, the allowable for the metallic skin of the honeycomb could be substituted in place of the panel allowable. For FEMAP elements experiencing unrealistic peak stresses, element averaging could be utilized to calculate a more reasonable stress for the peak. For metals loaded in their plastic range, hand calculations using principal stresses could be performed to find a more realistic margin of safety for that instance. For unresolvable negative margins, design change options had to be evaluated.

$$Bending\ Stress,\ f_b = \left|\left(\frac{Major\ Prin\ Stress - Minor\ Prin\ Stress}{2}\right)\right| * FF \qquad MS = FS - 1$$

$$Axial\ Stress,\ f_a = \left|\left(\frac{Major\ Prin\ Stress + Minor\ Prin\ Stress}{2}\right)\right| * FF \qquad \left(\frac{FS * f_b}{F_{bu}}\right)^m + \left(\frac{FS * f_a}{F_{tu}}\right)^n = 1$$

Results

- Updated stress analysis of stateroom grouping for FAA certification efforts.
- Verified FEMAP model and results using post-processing methods.
- Investigated design change due to negative safety margin.
- Revised documentation of grouping for compliance with FAA part 25 regulations.

Solar Damage Simulation

Vendor Project Engineering Co-op | Gulfstream Aerospace Corporation

Problem

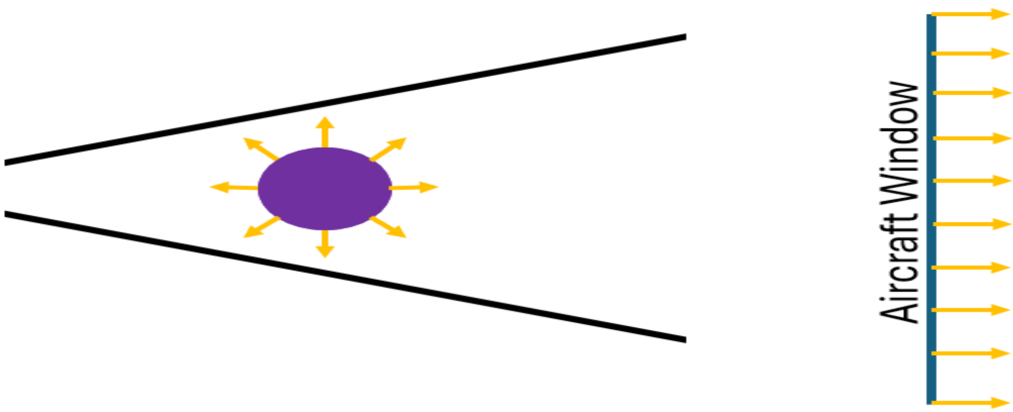
When exposed to direct sunlight for long periods of time, interior aircraft components can experience thermal and material degradation. The goal of this project was to design and build a laboratory test setup capable of simulating solar radiation on an interior vendor product in a controlled environment.

Method

Initial research on solar radiation was conducted to determine the wavelength of solar radiation emitted by the sun. Based on this research, a xenon arc lamp with a spectral similarity to sunlight was selected to imitate solar damage.

Example Xenon Arc Lamp

A solar damage simulation test fixture was designed in CATIA to simulate exposure through an aircraft window onto a component. The fixture featured housing for a xenon arc lamp mirror chamber that was designed to house the xenon arc lamp and direct its rays through the window onto the component using mirrors. The fixture also included housing for a makeshift aircraft window as well as housing for the component itself. The design efforts focused on using parts already manufactured in the R&D lab and minimizing the need for manufacturing. The completed setup allowed controlled exposure of interior components to simulate solar damage under repeatable test conditions.



Conceptual Xenon Arc Lamp Mirror Chamber

Results

- Successfully designed a functional solar damage simulation fixture capable of replicating long term sunlight exposure in a controlled test environment.
- Established a repeatable test method for evaluating solar-induced material and cosmetic damage
- Offered a source of early identification of durability issues for vendor and in-house components, reducing downstream risk during installation and certification.

DASSAULT SYSTEMES

SOLIDWORKS

CERTIFICATE

Dassault Systèmes confers upon

JACK VANDERMEULEN

the certificate for

Mechanical Design

DASSAULT SYSTEMES
MECHANICAL DESIGN
SOLIDWORKS ASSOCIATE

November 17 2021

Academic exam at Clemson University

Gian Paolo BASSI
CEO SOLIDWORKS

C-Z8JXE2U7Q3

Gulfstream™

A GENERAL DYNAMICS COMPANY

This is to certify that

John Vandermeulen

has satisfactorily completed the requirements prescribed by the Innovation, Engineering & Flight Continuous Improvement Department for Lean Six Sigma Certification for the title of IEF Certified Yellow Belt.

Michael Peacock
LSS Black Belt
Continuous Improvement Department
Innovation, Engineering & Flight

Certification Date

July 31, 2025

Chad Senkowski
LSS Green Belt
Continuous Improvement Department
Innovation, Engineering & Flight