

NASA Space Grant Intern Opportunity:

Utilization of Health and Usage Data for Helicopter Flight Operations Monitoring

Available for: 1 student (US Citizenship Required)

Organization: Sikorsky Aircraft Mechanical Diagnostics and Health Management Organization

Technical Lead: Dr. Jim Rozak

Sikorsky Space Grant Project Coordinator: Bob Frawley, 203-386-3033

Description

Sikorsky has been working with suppliers to develop a single software application that will analyze and simulate flight data obtained from commercial and military helicopter Health and Usage Monitoring Systems (HUMS) or Flight Data Recorders (FDR). Flight Data Management (FDM) programs are relatively new for helicopters and were originally developed by the commercial airlines to enhance operational safety by accessing, analyzing, and acting upon digital flight data. Known by various names (e.g. Flight Operations Quality Assurance FOQA or Operational Flight Data Management), the objective of FDM programs involves pro-actively using flight data to identify and address operational risks before an accident or incident can occur.

FDM programs are based on the “Heinrich Pyramid” which states that for every major accident there are several minor accidents built upon even more incidents and unreported occurrences. In other words, each unreported incident becomes the building blocks to a more significant accident. A FDM program provides more knowledge into accidents, how they occurred, and how they can be prevented in the future.

The software application being developed will be the primary software tool utilized in Sikorsky Aircraft’s Helicopter FDM efforts. The student working on this project will work under the tutelage of the Technical Lead and will help develop, evaluate and implement a process for the analysis of flight manual exceedances, identifying trends in parameters, and replaying of actual flight data to visualize helicopter flight and cockpit instrumentation.

Skills Required

- The ideal candidate will have a mechanical or aerospace engineering background.
- Good working knowledge of basis PC applications (e.g. Microsoft Office)
- Experience with C++/C# Programming language
- GPA: 3.0 or better

Helpful Skills

- Statistical Analysis and/or Modeling
- Understanding of aircraft piloting and flight dynamics

NASA Space Grant Intern Opportunity:

Development of Non-Destructive Rotor Blade Spar Health Monitoring Methods

Available for: 1 student

Organization: Sikorsky Product Safety

Technical Lead: Mr. Wayne Lovington

Sikorsky Space Grant Project Coordinator: Fred Brisbois, 203-386-3559

Description

The focus of this project is the non-destructive inspection of tubular titanium rotor blade spars contained within a helicopter rotor blade. A trade study of non-destructive blade inspection methods will be performed to determine opportunities for both real-time in-flight inspection as well as those methods appropriate for scheduled inspection. The work will revolve around a set of rotor blade operational inspection requirements.

This program will be on going and it is expected that the work of the students will be easily passed on to the student successor. Because of this, the student will have to document all work and be able to explain the results to their manager and other engineers. A final presentation/review of the accomplishments will take place at the end of the session.

Skills Required

- The ideal candidate will have non-destructive inspection background.
- GPA: 3.0 or better

Helpful Skills

- Material characterization
- Non-destructive inspection methods

NASA Space Grant Intern Opportunity:

Safety Cost-Benefit Analysis

Available for: 1 student

Organization: Sikorsky Product Safety

Technical Lead: Mr. Cliff Parizo

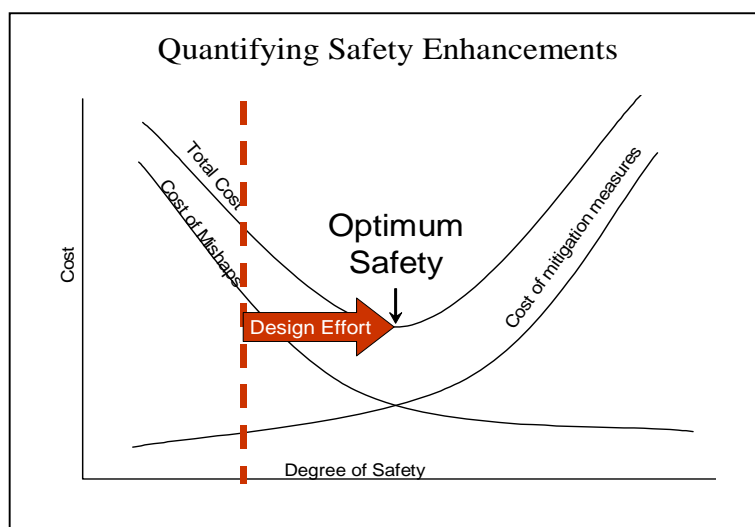
Sikorsky Space Grant Project Coordinator: Fred Brisbois, 203-386-3559

Description

The objective of this study is to develop a specific standard method for conducting a business case for evaluating potential safety enhancing design features, systems, and improvements. The student's technical approach will be focused on identifying all of the various stakeholder costs associated with helicopter accidents. The student will then develop a method by which the benefits of alternative safety solutions are quantified and assessed to determine an optimum safety solution.

Examples of mishap costs include loss of material, human resources, inability to perform missions, investigations, higher insurance premiums, affect on reputation and impact on future sales. Costs associated with mitigation include non-recurring development, acquisition, and potentially higher maintenance and support activities. This would allow a number of candidate solutions to be compared in a trade study fashion, with the optimum having the overall lowest life cycle cost.

The goal will be to develop decision making tools that can be applied throughout the product life-cycle; i.e. for development of new rotorcraft system platforms and for retrofit/upgrade of products already in service.



Skills Required

- The ideal candidate will have a cost/benefit background or a system engineering background.
- GPA: 3.0 or better

NASA Space Grant Intern Opportunity:

Development of Wireless Systems to Support Rotor Blade Spar Health Monitoring

Available for: 1 student

Organization: Sikorsky Product Safety

Technical Lead: Mr. Wayne Lovington

Sikorsky Space Grant Project Coordinator: Fred Brisbois, 203-386-3559

Description

This position offers the opportunity to get in on the ground floor of designing and testing a wireless sensor network for helicopter rotor blade instrumentation. Work will be performed to determine which wireless standard will be most appropriate for the application. The work will revolve around a set of rotor blade operational inspection requirements.

Initial sensor assessment should focus on a low-pressure sensor that could be used to detect structural failure (through cracking and loss of pressure) of an enclosed and sealed titanium structure. An appropriate wireless platform will be identified through a trade study process and a wireless network simulation will be built and tested. This will lead to actual construction of a sample network, which can be tested later in the effort.

This program will be on going and it is expected that the work of the students will be easily passed on to the student successor. Because of this, the student will have to document all work and be able to explain the results to their manager and other engineers. A final presentation/review of the accomplishments will take place at the end of the session.

Skills Required

- The ideal candidate will have an electrical and computer science engineering background.
- GPA: 3.0 or better

Helpful Skills

- System simulation
- Experience with wireless systems, i.e. Bluetooth, UWB, etc. is a plus
- Implementing software on various processors
- Digital signal processing
- Non-destructive inspection methods

NASA Space Grant Intern Opportunity:

Refinement of Rotor Blade Design Criteria for Flutter Stability

Available for: 1 student (US Citizenship Required)

Organization: Sikorsky
Engineering Sciences– Dynamics

Technical Lead: TBD

Project Coordinator: Steve Weiner, 203-386-3776

Description

Assuring freedom from aeroelastic instability is a key design requirement for helicopter blades. Limited analytic capability for accurately predicting the stability characteristics of a new design has led to the use of conservative design requirements or the need to make design modification once experimental data became available. Modern blades which utilize advanced geometry tips (e.g. sweep, taper and anhedral) and have only added uncertainty in this area.

There is recent evidence that state-of-the-art rotor simulation codes can successfully predict the stability characteristics of a new design. The advent of such a capability opens up the possibility that a set of generalized design criteria can be evolved for use by blade designers in the early stages of the design process. For example, criteria on blade natural frequencies and placement of structural axes for a given planform would be extremely useful. These criteria would improve the efficiency of the design process allowing more orderly evolution of designs which satisfied stability, performance, weight and manufacturing requirements.

The effort would consist of becoming proficient in the use of an available rotor dynamics simulation tool, determining the degree of correlation between stability predictions and existing model-scale rotor stability data, simulating the behavior of a parametric set of designs, generalizing the results into a set of design guidelines and documenting the effort.

Skills Required

- The ideal candidate will have theoretical background in aeroelasticity
- Access to computing facilities

Helpful Skills

- Willingness to learn and become proficient in the use of a comprehensive rotor simulation tool, through discussion with Sikorsky personnel and study of users manuals and technical manuals



NASA Space Grant Intern Opportunity:

Design of S-76D Engine Inlet and Nacelle

Available for: 1 student (US Citizenship Required)

Organization: Sikorsky Aircraft Corporation

Technical Lead: TBD

P&W Space Grant Project Coordinator: Steve Weiner, 203-386-3776

Description

Analyze the S-76D engine inlet and recommend design changes to improve aircraft and engine performance.

Aircraft performance analysis should include effects due to engine performance and parasite and momentum drag.

Engine performance analysis should include effects of airflow into the engine due to inlet design and resulting swirl.

Skills Required

- The ideal candidate will have an interest in the application of basic fluid mechanics
- Access to CFD software or lab facilities

Helpful Skills

- If CFD work is proposed, knowledge grid development and running a CFD code, such as Fluent
- Willingness to learn

NASA Space Grant Intern Opportunity:

Linking Cost and Technology History for Future Program Estimates

Available for: 1 student (US Citizenship Required)

Organization: Sikorsky Aircraft
Systems Engineering/Advanced Design/Affordability Analysis

Technical Lead: Greg Kiviat 203 386-7274/ Sebastian Botta 203 386-6935

Sikorsky Space Grant Project Coordinator: Andy Keith, 203-386-7729

Description

This position offers the student an opportunity to broadly interact with Sikorsky Finance, Programs, Engineering, Manufacturing, and Information Technology organizations. Project objective is to develop a process that captures and links past and current financial, program and technical data that will improve estimating quality, credibility, timeliness at lower cost for new proposals and other estimating activities. The data will be scrubbed, normalized and structured to enable preparation of Cost Estimating Relationships (CERs), parametric cost model calibrations and provide a solid Basis of Estimate for traditional estimating processes.

Each year hundreds of estimates for proposals, design studies, Rough Order of Magnitude (ROM) marketing evaluations, "what if" scenarios and other ad hoc analysis, ranging from very small (under \$20K) to very large (over \$4 Billion), are conducted. These estimates provide important insight into expected program engineering, manufacturing and support costs and are key to ensuring that future programs provide good value to the customer and are profitable for the company.

Tasks for the student will include:

- Interviewing functional, program and financial management
- Collecting financial, program and technical data
- Analyzing and evaluating data for relevance, format, accuracy and other attributes
- Normalizing data to consistent assumptions, format and structure
- Linking cost and program attributes (schedule, qty, etc) to program technical scope (weight, complexity, design attributes, manufacturing processes, etc) for major subsystems
- Developing a database to store and access data
- Entering data to the database
- Creating Cost Estimating Relationships for future estimates

It is likely that only a few program data sets can be captured in this time period. Periodic project status presentations would be made to Sikorsky Management. This challenging project would continue for other students or with internal Sikorsky support.

Skills Required

- Engineering or Information Technology background and interest in finance/economics issues
- Basic understanding of data structures, statistics and Information Technology
- Good organization and communications skills to collect needed data from Finance, Engineering, Manufacturing, Programs, and IT personnel
- The candidate should work well in a team environment and be self motivated
- GPA: 3.0 or better



Helpful Skills

- Willingness to learn about areas outside of current discipline including financial, program, engineering and manufacturing operations
- Ability to analyze data to identify key information that might be hidden
- Understanding of ACCESS and SQL databases



NASA Space Grant Intern Opportunity:

Development of Simulation Software to support Helicopter Design & Test

Available for: 1 student (US Citizenship Required)

Organization: Sikorsky Aircraft
Flight Dynamics Simulation

Technical Lead: Gary Faust

Sikorsky Space Grant Project Coordinator: Steve Weiner, 203-386-3776

Description

This position offers hands on full lifecycle software development of real/non-real time simulations for use in the design and development of air vehicle systems in support of analysis, piloted simulations, and stimulation of hardware in the loop during the on-ground system integration and verification process. Software development includes implementation of physics based algorithms for free flight dynamics models and development of graphical user interfaces and software tools in support of simulation analysis and design. The simulation product provides a non-linear, free flight simulation model for all of Sikorsky's current aircraft fleet.

This challenging project involves strong communication and teamwork skills due to the large customer base of the simulation, which is used as a major design/testing tool across Engineering.

Skills Required

- BS in Computer Science or Computer Engineering
- Working knowledge of UNIX/LINUX Operating Systems
- Working knowledge of C / C++
- GPA: 3.0 or better

Helpful Skills

- Working knowledge of the Perl Scripting language
- Experience with building GUI interfaces
- Implementing software on various processors