Customer Case Studies

Improving Corrective Action at an Aerospace Manufacturer

Relex FRACAS Provides a Complete Tracking and Analysis System

Summary

This case study demonstrates the potential for savings at a prominent aerospace manufacturer in the United States. The company is faced with the challenge of reducing the costs to ensure reliability compliance for a fleet of unmanned aerial vehicles. Currently, the company uses an internally developed set of tools that are expensive and cumbersome to maintain. By deploying the Relex FRACAS Management System, in conjunction with process improvements, they have the potential to show $220,000 in savings. In addition, they will have better capabilities for effectively managing reliability on future programs.

Background

The Reliability, Availability, and Maintainability (RAMS) team has implemented a manual Failure Reporting and Corrective Action Process (FRACAS) and is collecting reliability data from different parts of the organization. The goal is to generate reliability graphs for the entire system and key components to determine system availability and ensure contractual compliance. Overall, the process is time-consuming and expensive, taking as much as two months of effort to determine key metrics. Additionally, it relies heavily on the knowledge and experience of one key individual.

Because data is generated in the field, from the supply depot, and by quality assurance groups, the RAMS team has little or no control over the collection of the reliability data. Worse still, the data is in multiple formats, incomplete, and non-standard. Substantial effort is expended each month manually reviewing and cleansing the actual failure data. Given the lack of standardization, conducting relevant reliability analysis is problematic. In addition, the team is using a homegrown application for the collection and generation of reports, including system availability and Mean Time Between Failure (MTBF) calculations. This system lacks analytical tools for reliability evaluation, and it possesses limited capabilities for measuring, sharing, and tracking corrective actions.

Solution

The team will use the Relex FRACAS Management System, which encapsulates the best practice approach for a closed-loop, corrective action system. Relex FRACAS is a complete tracking and analysis system and provides a central source for maintaining reliability data. It organizes and stores all incident-related information, including the time, date, and circumstances of the incident, analyses performed, the recommended corrective action, and the action taken. As a result, users are able to effectively analyze reliability information to determine corrective actions. The workflow features within the product ensure the correct people are notified of required actions, and they permit the reliability team to monitor the effectiveness of corrective action plans.

Gathering Relevant Data

Data that impacted reliability is being generated by six different departments within the company. Both the failure data and product data are stored in separate locations and formats. The distributed, non-standard nature of the data presents a significant challenge to the reliability team in terms of effectively collecting and analyzing the information.

Failure data is currently being collected at the supply depot for returned parts, from field support engineers, and

through the customer support team that fields questions on the support of the fleet. Data from these sources includes the failure description, step in the process where failure occurred, operating time, and number of operations. The reliability team is also maintaining its own database of stored failure information, which represents an incomplete set of incidents.

Within another database in the organization, the engineering team is maintaining part descriptions, diagrams, and bills of materials. In addition, the test group is also collecting information on the failure modes and adding it to the product database.

The first step is to gather relevant failure and product data into a single FRACAS database, as shown in Figure 1. The benefit is to ensure a common foundation for monitoring the reliability of the fleet across different locations.

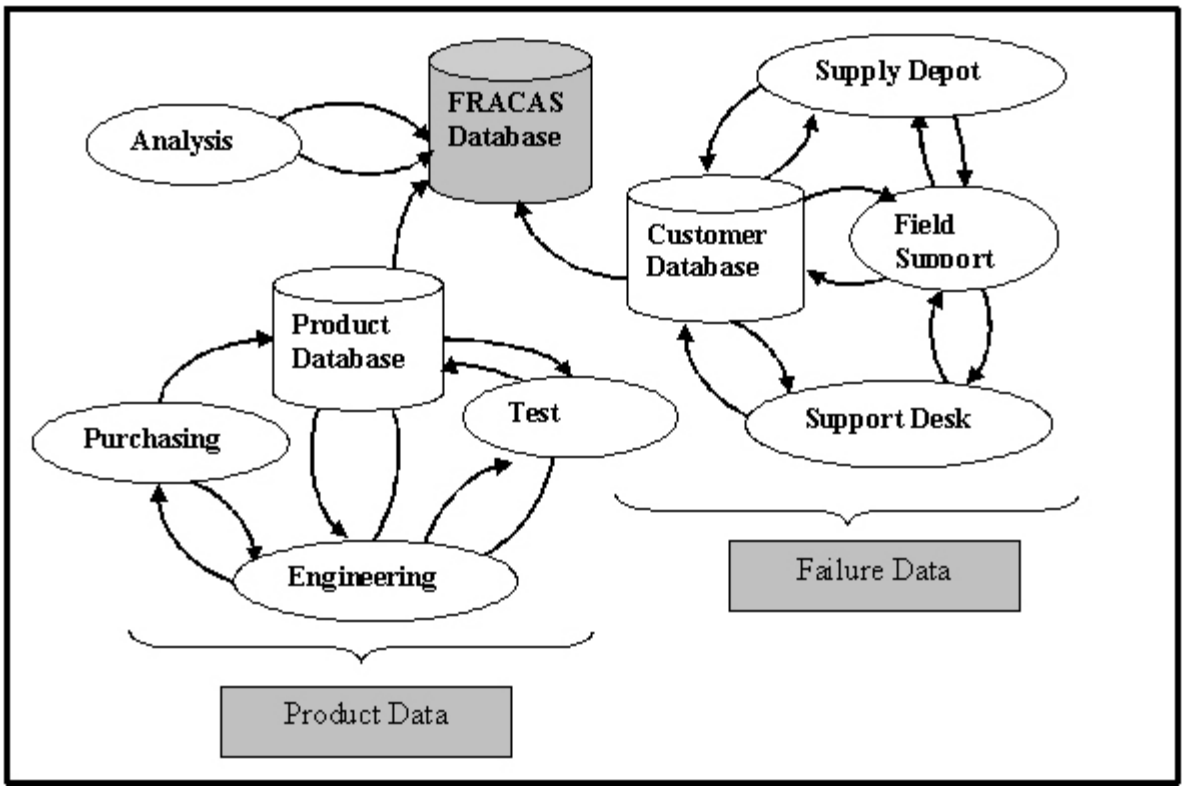

Figure 1 - Creating a Single Repository of Reliability Data

Ensuring Data Integrity

The next step includes cleansing the collected data to eliminate redundancies and reconcile inaccurate or incomplete information. This element is particularly important since neglecting this step would introduce uncertainty into the calculation of system availability. The impact would be to misstate the actual operational availability and placed the program outside of contractual obligations.

Ensuring Contractual Compliance

Mission readiness is an important consideration for the program. To fulfill contractual obligations with their customer, the RAMs team needs to demonstrate operational system availability exceeding a predetermined threshold each month. Generating system availability graphs typically involves a series of data manipulations through several tools and several manual calculations. It is a time-consuming, tedious effort taking up to two weeks of a dedicated reliability engineer's time.

Generating Operational System Availability

To comply, the team will utilize Relex FRACAS to determine key metrics, including MTBF for selected components, Mean Time Between Mission Critical Failures, and overall system availability.

In this environment, there are unique considerations that go into the system availability calculation. By customizing calculations within Relex FRACAS, the team is able to produce a meaningful availability graph within minutes (Figure 2).

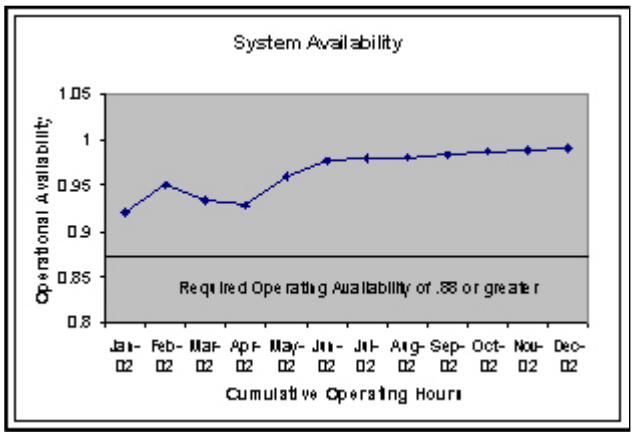

Figure 2- Sample of Operational Availability over Time

Note: This is a sample data set

Defining the Cost Savings

There are several key costs associated with the current system. In-house programmers are required to support and maintain the current tools at a cost of $100,000. Additionally, producing system availability reports consumes two weeks of a reliability engineer's time. Over the course of the year, this amounts to 24 weeks of effort. Furthermore, the cost of maintaining the data was $80,000 annually. Through standardized entry of failures into the FRACAS system, the team is able to eliminate this cost. Total cost savings will exceed $220,000.

Future Improvements

The manufacturer not only saves costs for the existing program, but the manufacturer will be able to apply these savings to future Department of Defense programs. In addition, the manufacturer is able to perform additional reliability analysis to more quickly identify potential problem areas and create an effective closed-loop corrective action process to ensure reliability compliance.

Identify Severity of Failures

Gathering data will be more efficient as customers are able to participate through web interfaces to make entries directly into the FRACAS database. Standardized forms also ensure that the description of failure information is consistent and can be analyzed for relevant trends.

As a result, the team is able to quickly identify the class and severity of failures through Pareto Chart analysis. An example is shown in Figure 3. The outcome is that corrective actions can be determined and assigned more quickly.

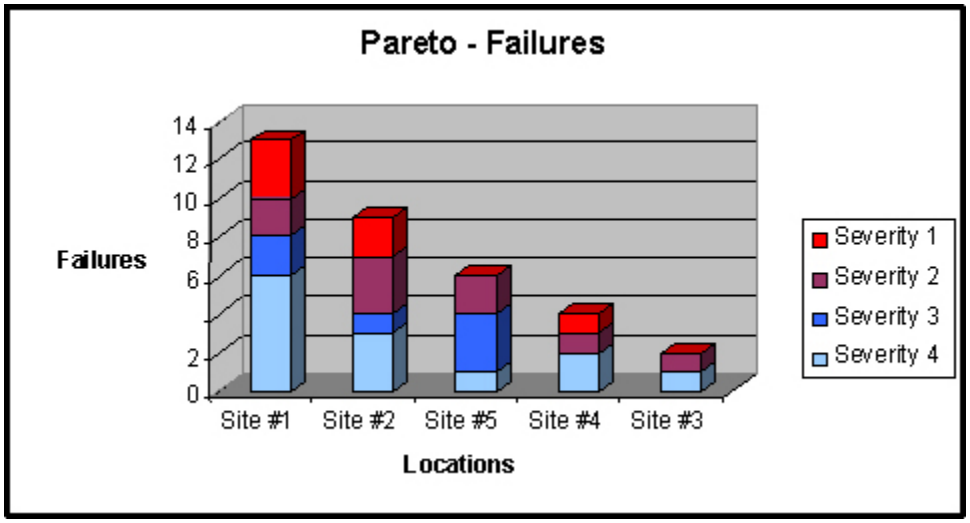

Figure 3 - Pareto of Failure by Severity Level

Assign and Rank Costs of Failure

Although the overall goal is to ensure mission readiness and meet system availability targets, there is a secondary goal to achieve this in a cost effective manner. By using Relex FRACAS, the team can now assign costs to failures as well and measure the overall impact to the program. A representative report of operational costs/failures by component is shown in Figure 4. As a result, they can assign priorities and allocate resources for analysis and corrective actions.

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Cost/Failure by Component

File Name: Sample Fuel Injection - FRACAS Project v2.rtp
Last Modified: 3/14/2003
Report Date: 3/14/03
Report Time: 11:36 AM

Name	Part Number	Manufacturer	Equivalent Time	Number of Failures	Cost
Fuel Injection System	FI-IV		5121782.91	1.00	$172,380
Electronic control subsystem	ECS5		5121782.91	.00	$135,480
Electronic Control Assembly	ECA1		5121782.91	12.00	$32,880
Engine Coolant Temperature Sens	ECT1		5121782.91	4.00	$7,100
EGR Valve Position Sensor	EGR1		5121782.91	5.00	$26,900
Fuel Pump Relay	FPR1		5121782.91	4.00	$8,250
Oxygen Sensor	O2S1		5121782.91	5.00	$13,350
Idle Speed Control	ISC1		5121782.91	6.00	$13,150
Manifold Absolute Pressure Sens	MAP1		5121782.91	4.00	$11,150
Throttle Position Sensor	TPS1		5121782.91	6.00	$10,000
Vehicle Speed Sensor	VSS1		5121782.91	4.00	$12,700
Fuel Delivery Subsystem	FDS7		5121782.91	.00	$29,700
Fuel Injectors	FI17		5121782.91	9.00	$18,150
Fuel Pump	FP4		5121782.91	2.00	$9,000
Fuel Filter	FF1		5121782.91	3.00	$1,050
Fuel Tank	FF3		5121782.91	.00	$900
Fuel Lines	FL9		5121782.91	.00	$600
Air Induction Subsystem	AIS22		5121782.91	.00	$7,200
Air Bypass Valve Solenoid	AIRB4		5121782.91	1.00	$3,450
Vane Meter	VM23		7094608.11	2.00	$3,750

Figure 4 - Sample Report of Cost/Failure by Component

Assign and Track Corrective Actions

By reviewing the failures and prioritizing both on cost and severity, the RAMs team is able to identify problem components. Corrective actions can be determined and assigned to specific individuals through Relex FRACAS. On a monthly basis, the failure review board is able to monitor progress with selected corrective actions. Over time, the team

can measure progress and chart reliability growth as shown in Figure 5.

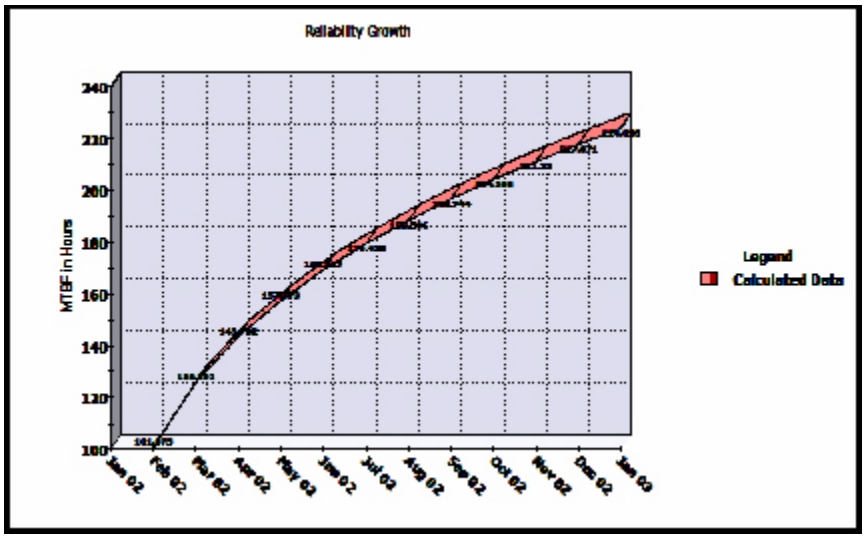

Figure 5 - Reliability Growth Curve

About Relex Software Corporation

Relex Software Corporation is a world leader in reliability analysis software. Its products are used by thousands of engineers in a variety of businesses around the globe. In business since 1986, Relex Software Corporation produces a superior line of high-quality software tools for reliability analysis.
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