



# NAVAIR OVERHAUL



NSF DUE # 0653277

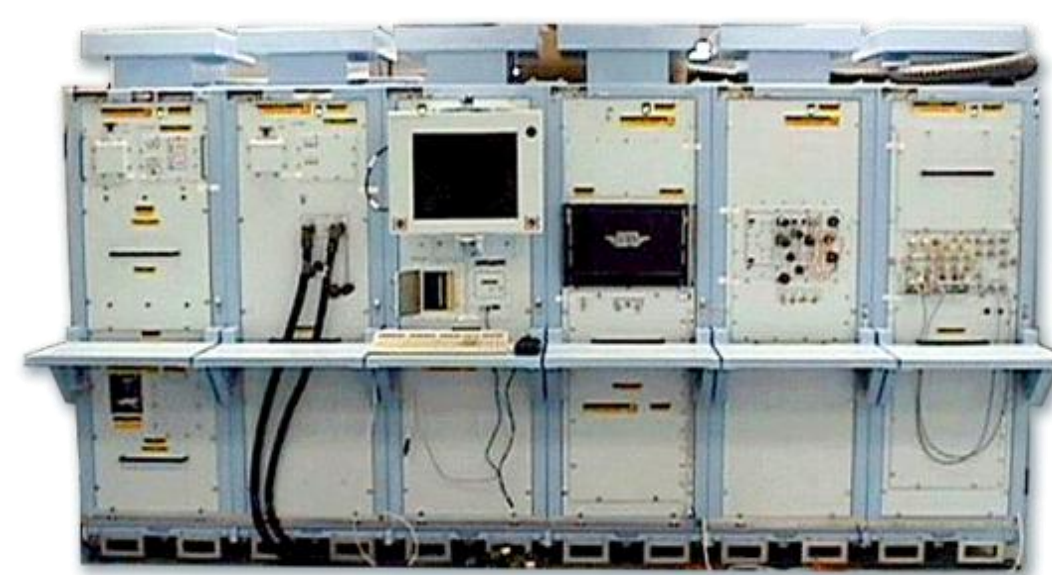
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## Introduction

Fleet Readiness Center (FRC) is composed of both civilian and military personnel who are able to provide assistance in the overhauling of aviation as well as ship engines. In order to provide top quality products for their clients, Fleet Readiness Center endeavors to remain as a "leader in innovative aviation maintenance solutions, committed to customer, workforce and community."

## Methods

One of the functioning facilities that ensures proper maintenance for US Navy aircraft is the Automatic Testing Equipment Laboratory. The department that contains this laboratory specializes in the operations of technical machines that performs diagnostic testing on avionic equipment. The development of software is also consistent with the process of examinations for the aircraft's equipment since it outlines the type of assessment that the programmer wants to analyze. The program would be processed through the test stations also known as the Testing Program Set that would then indicate the status of the components in the equipment. As an intern in this department, I built databases based on AutoCAD schematics that is relevant to the cables and devices that enables connections between the avionic and measuring equipment.



One of the test stations that is used to test the various components in the circuit in order to determine which is to be replaced or enhanced.

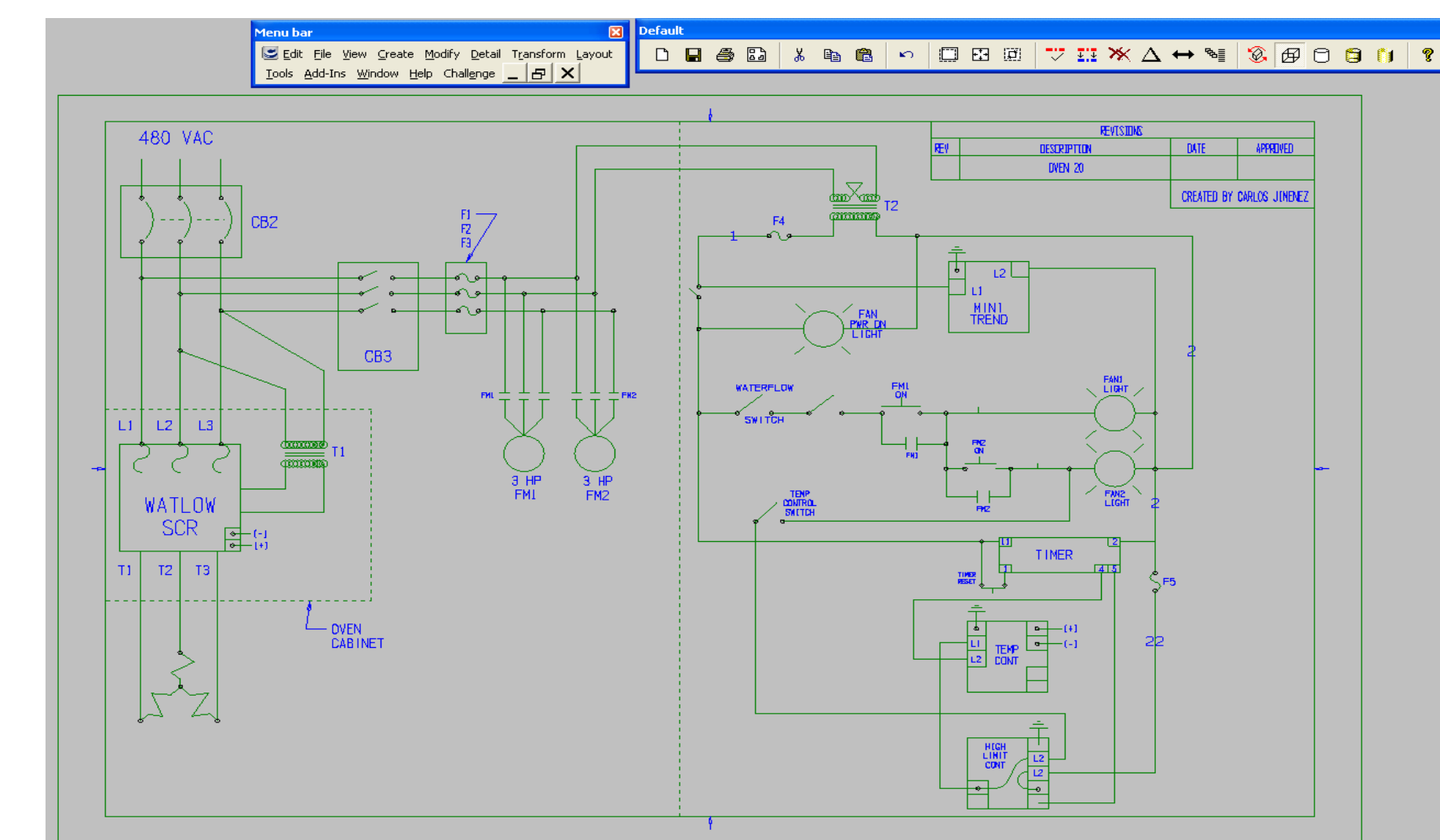
As a part of the E-2C and C-2A Fleet Support Team (E2C2FST), I was mostly engaged in providing repair instructions to depot level artisans for the C-2A service life extension program (SLEP) via rapid reply request (3R) forms. One of the more frequent SLEP 3R forms are those addressing discrepancies in the upper longeron area of the C-2A aircraft. The upper longeron area of the airplane is very problematic because it is a high stress area. In order to reinforce the longeron, I provided instructions for the artisans to apply the process of coldworking and installing interference fit fasteners (IFF) into the various fastener holes.



The red oval on the figure depicts the upper longeron area of the C-2A. This is also the area where the wings are attached to lugs. While in the air, the aircraft's own weight is being sustained by the lugs and hence the high stress.

Coldworking a hole will create a residual annular compressive zone. Then, the installation of IFF, under the right conditions, has great potential to increase the magnitude of the compressive zone which reduces the hole's susceptibility to cracking.

The Engineering Services department is responsible for providing design, drafting and engineering services for modification, the manufacturer, installation, operation of depot, peculiar production support, equipment and systems, industrial processes, and controls for industrial and support shops. They investigate accidents involving Industrial Plant Equipment (IPE), facilities, or facility equipment. They also conduct Reverse Engineering Analysis using standard engineering practices. They analyze and manipulate raw measurement data to produce complex surface computer-aided drawing (CAD) models for use by numerical-control (NC) programmers and cognizant engineers for aircraft or aircraft components. As part of this department, I was able to use the KeyCreator software in order to design the schematics for various ovens which are used for manufacturing numerous components. decreases repair

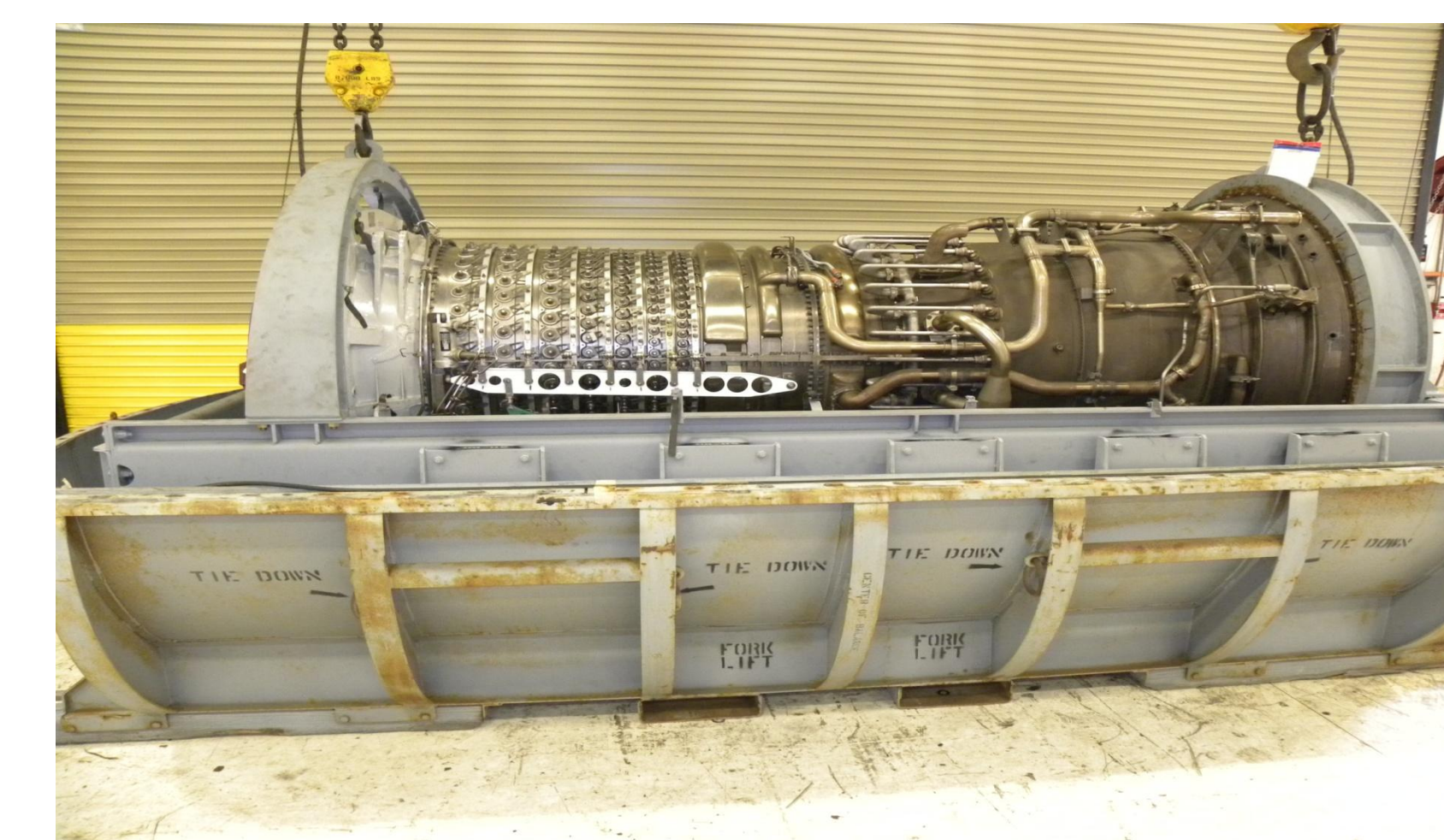


One of various schematics used to provide our services.

The LM 2500 Engineering support is in charge of providing consultation for LM 2500 overhaul program. NAVSEA, our main customer, sends in worn out or faulty engines. It is our

job to strip them down and do a complete overhaul of every piece which includes repairing some parts and replacing others for cost effectiveness. Part of the overhaul also includes implementing any improvements/changes that the OEM, GE, has implemented. Some of the improvements include adding digital control systems.

The over haul is needed because gas turbine engines undergo extreme amounts of stress during their lifetime. They hold an idle speed of about 5000 rpm and can sometimes be pushed to as much as 9100 rpm, all while producing extreme temperatures.

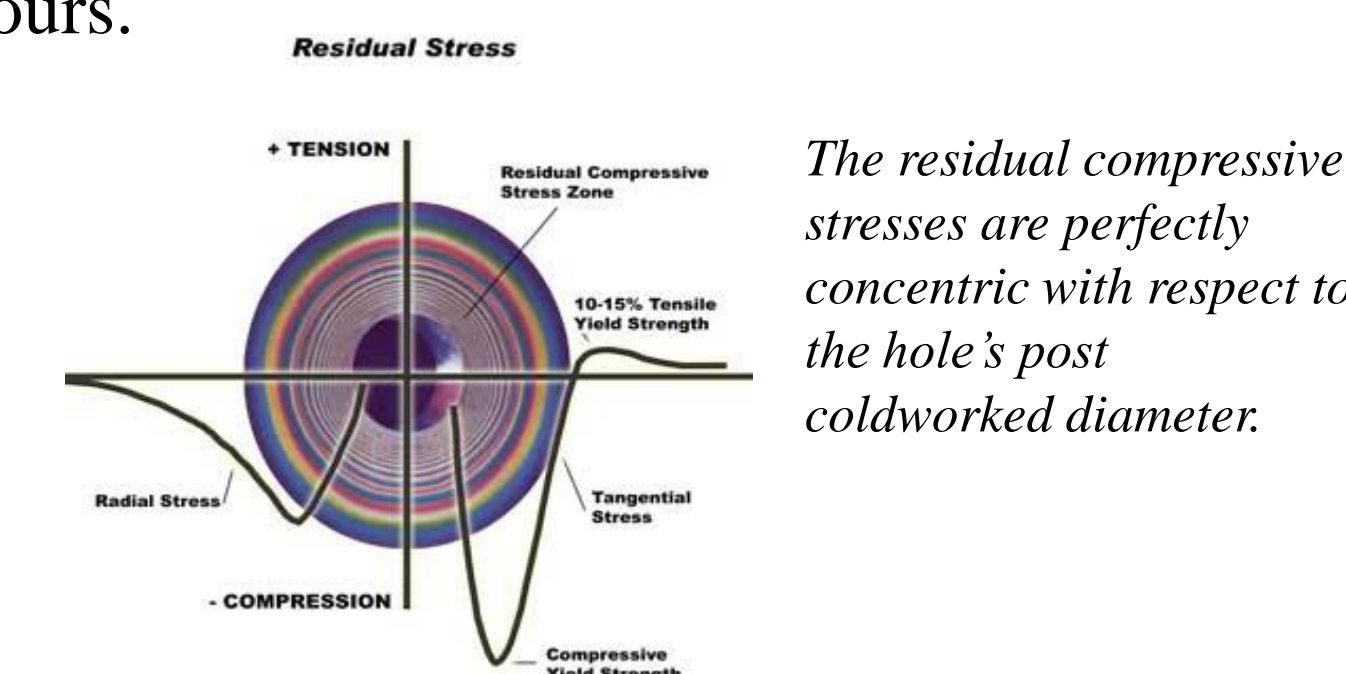


After LM 2500 reassembly, it is put in a shipping crate to ship back to the customer.

## Results

The databases would be used as documents for future references to identify the available equipment that is in storage. Once components are known and provided, the avionic equipment will go thru stages of testing. This allows the engineer to interpret the results to identify whether any future repairs would be necessary. If every test is satisfactory then the equipment would be sent back to be installed into its original location such as the inside of an aircraft.

The annular compressive stresses of each post-coldworked hole will counteract the induced tensile stresses that cause fatigue cracking and ultimately increase fatigue life. Coldworked holes reinforce the area they are located in, which will eventually reinforce the structure that they are on, which will ultimately reinforce the whole aircraft such that it will be able to fly the mandated flight hours.



This experience at FRCSW has given me a taste of what my future life will be like. Working with the KeyCreator software has allowed me to successfully create, design, and analyze basic schematics. In addition, I was also introduced to three dimensional modeling for part and tool design of aircraft components. More importantly, the experience I received from my fellow employees and interns helped me reach my future goals.

Metal components are typically repaired by metal coating with chromium IV or metal sprayed. The parts are then ground down to size and carefully measured to strict tolerances. Also, each individual blade of the turbines are weighed and balanced rotor by rotor until the entire assembly is fully balanced. The newly repaired and replaced parts are re-assembled to create an overhauled engine. Then, the engine is taken to a test cell to be tested. During testing, the vibrations of the engine are carefully monitored. If the vibrations are high, then weights are added to certain areas. Moreover, further inspection is conducted to check for correct reassembly and balancing. After the engine passes the test, it is packed into large metal nitrogen sealed containers (which prevents corrosion) and shipped off to NAVSEA.

## Conclusion

During our time at our respective internships, we were exposed to real world engineering situations such that thinking beyond the ideal problems we encounter in our textbooks was required. We were also exposed to technologies that that are used on a day to day basis in order to carry out important engineering processes. We also gained valuable experience in the political side of engineering by interfacing with various personnel and maintaining all pertinent paperwork in order.

## Acknowledgements

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