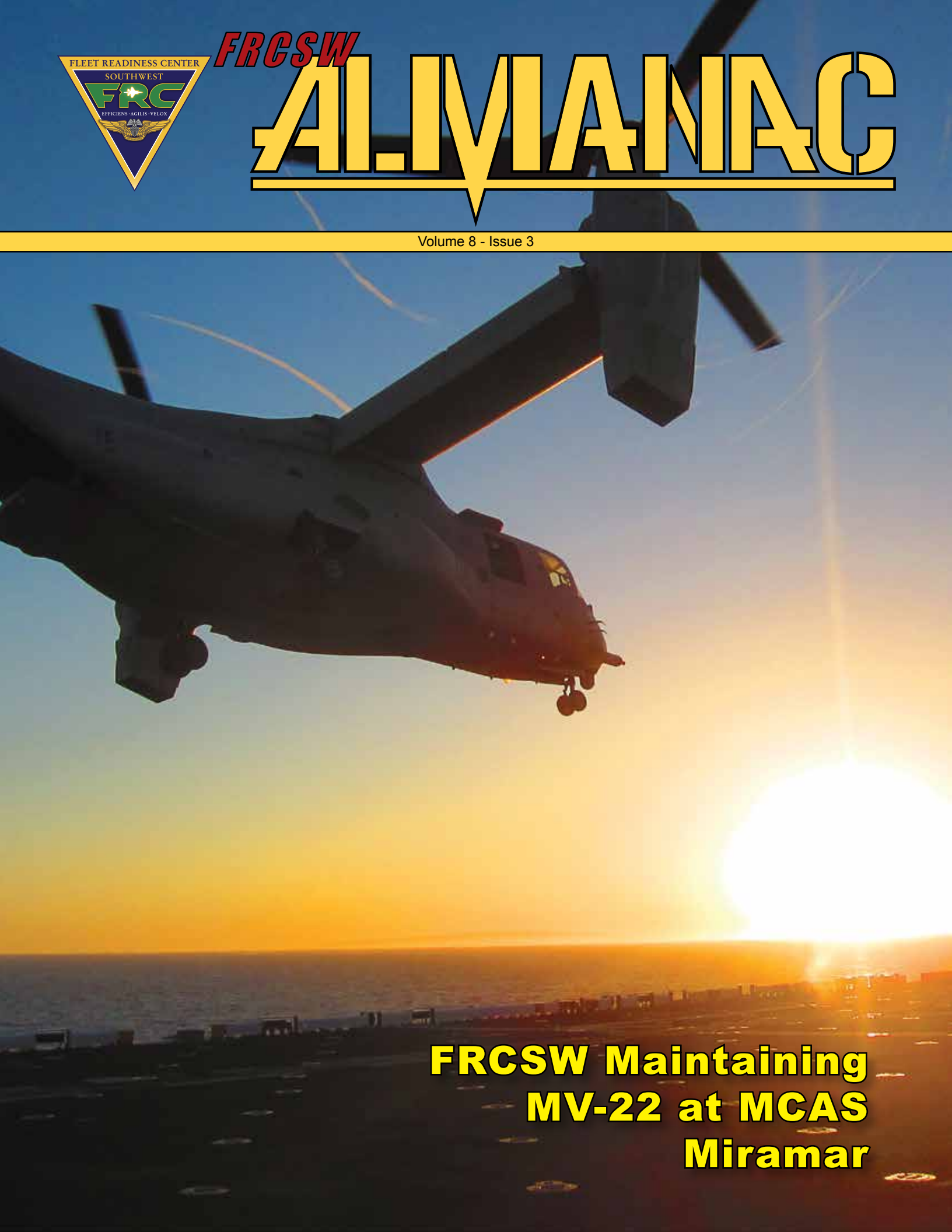

FRCSW ALMANAC

Volume 8 - Issue 3

FRCSW Maintaining MV-22 at MCAS Miramar

Skipper's Corner:

Happy New Year!

Capt. Timothy Pfannenstein

HAPPY NEW FISCAL YEAR!!! As we begin FY16, allow me to take pause to recognize your superlative efforts in FY15. While it was indeed a challenging year, you all persevered and should be very proud of what you accomplished.

Here are just a few of the things your hard-work achieved in FY15.

N42: Sold 168 F/A-18, E-2, C-2, H-60, H-53, H-1, AV-8, JSF aircraft back to the fleet, executed nearly 17,000 component repairs, manufactured and processed over 103,000 end items, completed over 2,400 In-service Repairs, restored 63 USMC Mobile Maintenance Facilities (MMF) to service, rebuilt and tested 22 LM2500 sea-going engines, provided critical flight deck services on five aircraft carriers and two airfields and stripped and painted 558 aircraft and drop tanks.

N45: Established as the premier compliance organization in COMFRC and laid the foundation for a trend setting Safety Management System (SMS). N45 personnel at FRCSW also achieved an FRC best TCIR/DART rate for the second straight year, well below industry standards.

4.0: This team broke the logjam in completing F/A-18 REIs. They completed over 50 SLEA messages in support of F/A-18 aircraft and sub-components, set the tone for speed and accuracy by reducing REI WIP and improving performance in on time delivery and first pass yield.

6.0: Achieved the highest Bill of Material Accuracy rate of any FRC, successfully completed two Inspector General (IG) reports regarding quality, fully implemented the Concert Program, achieved optimal results on all NAVAIR financial audits, successfully hired more personnel in one year than in the previous 10 years combined and acquired and restored dozens of pieces of highly critical equipment to service at FRCSW. On the high side 6.0 continued to achieve excellence in technical data accuracy, logistics program support and analysis in support of FRCSW and Program offices.

7.0: This team moved into new frontiers with apprenticeships and supervisory management training, delivered on-time financial and administrative products, broke-ground on high tech data systems, reduced employee discipline issues by over 300 percent, set the FRC trend in Diversity events, achieved the highest rates of security compliance among depots, led the way in strategic and tactical communication. The team also relentlessly pursued employee safety compliance and in so doing garnered above threshold grades in every single measurement area.

10.0: The FRCSW financial personnel fully met all obligations and critical performance factors in the FIAR process thus posturing FRCSW to be fully compliant by October 2017. They also reduced production carry-over by millions of dollars and successfully implemented new data tracking tools to measure, monitor and track IPT performance.

11.0: Legal successfully litigated dozens of disputes, grievances, complaints and class actions brought on by internal and external entities.

Level II's: Both NASNI and Point Mugu were CNO nominees for the Department of Defense Phoenix Award by collectively delivering more than 21,000 components to the Fleet and completing 140 T700, 13 T56-A-425 and 12 T56-A-427 engines during the FY.

Virtually everyone at FRCSW can see themselves in this "goodness." Our challenge is to keep it going and do even more in FY16. During the next year, you will be asked to perform faster/more efficiently and to do so while training those at your side to become effective parts of our team.

In FY16 we will continue to hire, work to reduce our Net Operating Results (NOR) and, as always, continue to generate readiness for a Fleet that is incredibly hungry for our products.

As we move into FY16, let's give the Fleet everything they need to be successful, because as I have said before, they cannot do what they do, if you do not do what you do! GO FRCSW!

In Your Service,

Timothy H. Pfannenstein

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FRCSW Mission & Vision

Mission

We generate readiness through timely and responsive production of engines, aircraft, and components for the warfighter.

Vision

To be the premier maintenance repair and overhaul organization in the Department of Defense by providing the best value, highest quality, and most reliable products.

FRCSW is a cornerstone of future Naval Operations which we achieve through a highly capable workforce and robust community partnerships.

FRCSW ALMANAC

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FRCSW ALMANAC

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Electrical equipment repairer Nathan Budde removes the bearings from an F/A-18 *Super Hornet* generator in Building 378.

Photo by Jim Markle

About the Cover

An MV-22B *Osprey* tilt-rotor aircraft from Marine Medium Tiltrotor Squadron (VMM) 163 lands aboard the amphibious assault ship USS *America* (LHA 6) during deck landing qualifications.

Photo by CWO4 Shane Duhe

Features

FRCSW, FRC East Setting V-22 Maintenance Schedule

Photos by Jim Markle

V-22 *Osprey* aircraft are lined up outside of Hangar 6 at Marine Corps Air Station Miramar.

Fleet Readiness Center Southwest (FRCSW) is joining FRC East, located at Marine Corps Air Station (MCAS) Cherry Point, in handling the Navy's Integrated Maintenance Program (IMP) requirements of the MV-22 *Osprey* tilt-rotor aircraft.

The two FRCs will also oversee IMP applications to the Air Force's Osprey fleet.

The IMP targets the structural integrity of an aircraft and is divided into two cycles: Planned Maintenance Interval-One (PMI 1) or 2. For years it has been applied to other naval airframes including the H-60 multi-purpose *Seahawk* helicopter and the F/A-18 *Hornet* fighter.

Some of the finalizing details to the maintenance program are being developed at FRCSW Site MCAS Miramar and are led by Ed Roberson, Vertical Lift DIPT V-22/H-1.

"The specifications for the PMI 1 give us all of the areas that we are asked to look at and fix or repair. We look at the aircraft from tip to tip; we look at everything," Roberson said.

PMI specifications were developed by engineers and the IMP lead from FRC East.

FRCSW inducted its first Osprey July 13. It is assigned to Helicopter Marine Medium–Squadron 363 (HMM 363) stationed at MCAS Miramar.

The command enlisted 15 artisans including four contractors to work the Osprey IMP project at FRCSW Site Miramar. All volunteered and many have maintenance experience on the H-53 and H-60 helicopter airframes.

The artisans underwent comprehensive training which included a one week familiarization course in April at FRCSW Site Miramar that was led by a subcontractor to Boeing (the V-22 manufacturer). It included a day of hands-on training with the aircraft, and was followed by a two week on-the-job-training session at Cherry Point.

Roberson said that painting and stripping will be the final training phase to the project, and should be completed sometime before the end of December at Cherry Point.

"The V-22 stripping process is all hand-sanded," he said. "There's no media blast on it because it's all composite on the outer skins, and that's all done at the end of the PMI 2 event."

V-22 Maintenance

Mechanics Stewart Clark, left, and Timothy Kelln pause from removing the fuel system from a V-22 *Osprey* in Hangar 6 aboard Marine Corps Air Station Miramar.

"As a work around right now PMI 2 will be a field event, but once the event is complete, the aircraft will be flown to North Island where it will be painted. That will be called a `PMI 2 Plus' and it will be our last training evolution for this aircraft," he said.

Meanwhile, PMI 1 at FRCSW Site Miramar will remain a field event.

Changing of the V-22's leading edge flap is one example of a PMI 1 requirement. To do so, artisans must remove the aircraft's fuel system which is comprised of five fuels bags in each wing.

Removing components is relatively easy for the skilled artisans. But the majority of the V-22s have already flown to their 72-month service maximum, creating a backlog of depot-level work for an airframe still undergoing IMP finalization.

Although the airframe is backlogged, Roberson noted that the FRC artisans will get some help from the Marines Corps due to the aircraft's integrated maintenance scheme.

"We're using organization (O)-level to fix O-level discrepancies; so the Marines are coming out with the discrepancies they found and are fixing those parts," he said.

"Aircraft disassembly will be O-level responsibility. In the field event the Marines will tear the plane apart, clean it and they're responsible for all of that gear. And when we're done with our part, they (Marines) come back and put it all together."

In January MCAS New River in Jacksonville, N.C., established an IMP staff to service its V-22 squadrons. The FRCSW team visited the site to gain insight into the integrated procedures from the Marines there.

"I think by this time next year it will be running smooth here. For now, a lot of the Marines here are O-level CH-46 guys, and are unfamiliar with the IMP and have never seen a field event. So this is not only training a team here and its employees, but we're also introducing this new concept to every squadron on this flight line," Roberson noted.

As the IMP work procedures evolve on the airframe, FRCSW artisans are discovering repair and maintenance

Marines with Marine Medium Tiltrotor Squadron (VMM) 163 perform pre-flight checks on an MV-22B *Osprey* prior to a training flight aboard MCAS Miramar, Calif. *Photo by Sgt. Melissa Wenger*

issues that are unidentified in the PMI specification.

In the course of completing the IMP of the aircraft, Roberson said that there were two issues pressing for resolution: Meeting the projected turnaround time (TAT) for PMI 1 and 2 and the status of request for engineering information (REI) as it relates to aircraft repairs, and parts requisitioning.

TAT for PMI 1is set at 80 days and 120 days for PMI 2.

Roberson said that parts requisitioning may be the most difficult issue to overcome because they are not readily available and have a long wait to get them. Consequently, REI are common as forced repairs, vice replacing, become the only option.

FRCSW Site Miramar is funded to service five V-22s next year.

"We're estimating about six or seven aircraft per year once the program gets established and running at this site, and when North Island is capable of taking the V-22s, it will be the same number at that site, so we'll double the throughput –14, maybe 16 aircraft," Roberson said.

Roberson said that future V-22 workload will include an IMP standup at FRCSW Site Kaneohe Bay and that a site at FRCSW North Island will be established to complete PMI 2 workload on the airframe.

Further, FRCSW will take the lead in standing up the V-22 IMP at Cannon AFB in New Mexico. FRC East is currently performing V-22 IMP workload at Hurlburt Field AFB, Fla.

Generators, GCU Shop Puts the Power in Planes

Photos By Jim Markle

Electrical equipment repairer Nathan Budde removes the bearings from an F/A-18 *Super Hornet* generator in Building 378. The FRCSW generator shop repairs, overhauls and returns more than 1,500 components annually to the fleet.

All naval aircraft require a source to power their electrical systems. That power source is found in the generators and generator control units (GCU) of the aircraft; crucial components that are serviced at Fleet Readiness Center Southwest (FRCSW).

Electrical equipment repairer Robert Pugeda prepares to rebuild the GCU of an F/A-18 *Super Hornet*. Rebuilding the GCU will require approximately 45 manhours, and the installation of about 30 new parts.

Electrical equipment repairer Tim Grunseth removes the silicon controlled resistor (SCR) from an F/A-18 legacy generator control unit (GCU) in Building 378. The GCU provides power to all of the aircraft's electrical systems.

To handle its workload, the FRCSW generator shop in Building 378 employs 31 artisans including aircraft electricians, instrument and electronics mechanics, electrical equipment repairers, and electronic integrated systems mechanics.

Work lead Will Stroud said that the shop repairs and overhauls more than 300 generators per year and over 1,500 components annually.

"We work on generators belonging to F/A-18 *Hornets*, AV-8B *Harriers*, H-53, P-3, E-2/C-2 and our future workload will include the V-22 *Osprey* and the F-35 Joint Strike Fighter (JSF) and possibly some drone work. We're ready for the Osprey and just waiting for their rep to send us units, and we have a room ready with the test stand for the JSF," said shop supervisor Jorge Torres.

The shop services two types of generators: Air-cooled generators that use fan blades to cool them and are typically found in helicopters, and oil-cooled generators that are used in aircraft like F/A-18s.

Generators scheduled for maintenance or overhauls are evaluated, disassembled, and their rotors removed, inspected and repaired if necessary. The generator's bearings are also changed and inspected and tested before the component is distribution to the fleet.

"How long a generator lasts depends on the platform," Stroud said. "Some of them have scheduled removal cards. Some are 2,000 hours, for example, meaning they will come here for an overhaul after that certain period of time."

Generators that have scheduled repairs are mostly the air-cooled generators found in the E-2/C-2, P-3 and H-53, he added.

Stroud said that the most time consuming overhaul for the shop is the F/A-18 *Super Hornet* generator control unit (GCU) which takes 110 to 120 manhours. The GCU provides power to all of the aircraft's electrical systems.

"The GCU is not serviced at the intermediate (I) level. The I-level can make minor repairs to GCUs, but when it's beyond their capability it's sent to us. If the GCU generator is bad, for example, they (I-level) can order a new one from supply and install it and hopefully that will take care of the repair," Stroud noted.

GCUs are repaired as needed. Its generator and rotor are removed from the housing unit and the bearings checked and replaced as required. Other GCU components that are inspected include the unit's power supply, shop replaceable assemblies (SRA), or circuit cards, and the silicon controlled rectifier (SCR) which maintains the current output of the generator. Chaffed or broken wire connections are also repaired.

"We use the Aircraft Engine Components Test Stand (AECTS) to test the Super Hornet circuit cards in the GCU. There are three circuit cards that we test here," Torres said. "The legacy Hornet GCUs also has circuit cards, but those are worked on in Building 463."

Overall, the shop has eight test stands used for troubleshooting and testing GCUs and SRAs.

To ensure the integrity of repairs, the components are intentionally overstressed as part of the testing procedure. Overhauled GCUs, for example, are run on an AECTS for more than five hours.

Since 2001, the shop's Super Hornet GCU workload operates under a performance based logistics (PBL) agreement. PBL agreements are partnerships between commercial vendors and FRCSW.

Boeing served as the initial PBL agreement holder until four years ago, when the General Electric Co. assumed the contract.

"Under the PBL GE supplies the GCU parts, about 30 components total per kit, including one of the circuit cards, but we (FRCSW) handle all of the ordering of the parts," Torres said.

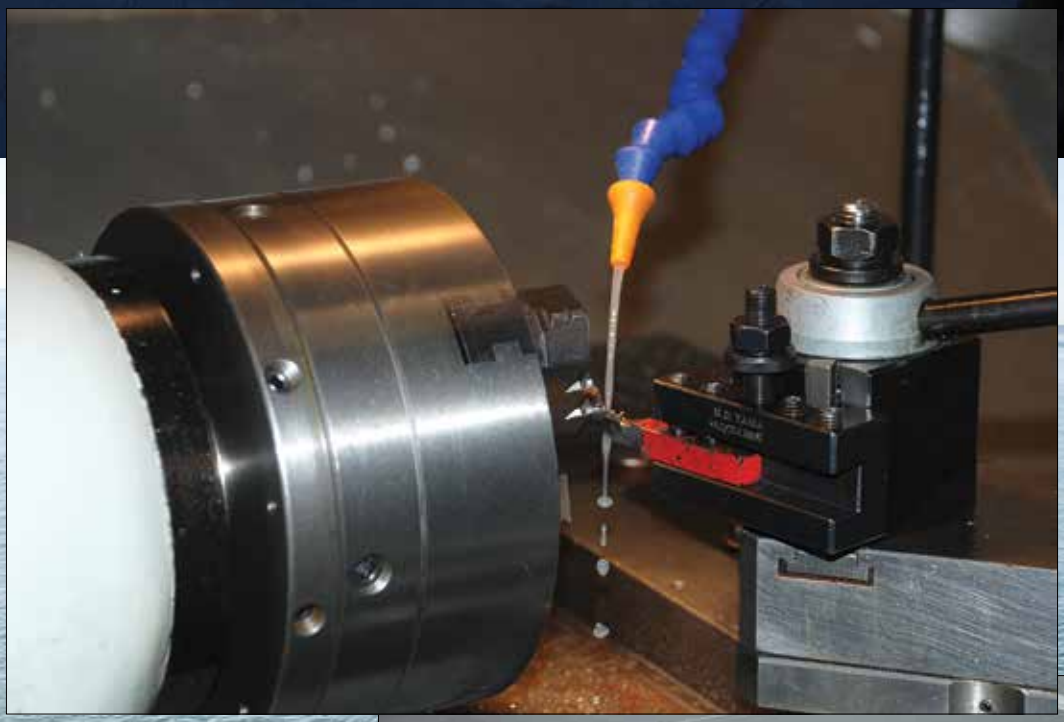
"We will subcontract with GE, so we'll make any repairs which will go through our regular Quality Assurance procedures. Then the unit goes back to GE who sells it back to the fleet through Navy Supply Systems Command," Stroud added.

Torres said that a PBL agreement with Honeywell is scheduled for the future V-22 Osprey generator workload.

"As it is our workload comes in from all over, not just the West Coast, and our customers include foreign military sales," he said. "For the F-35s, we'll be doing all of the Navy's and the Air Force's once that comes online."

FRCSW Site - NAS Whidbey Island, Wash.

Photos by Mike Furlano

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Metal Processing Shops:

Controlling Corrosion and Wear

Metal processing mechanic Justin Holahan drops seals to an LM2500 engine into the alkaline strip tank in the Building 472 clean shop. The seals will be placed in a hot rinse solution is part of the refurbishment process. *Photos by Jim Markle*

Reworking the crucial metallic components of aircraft that have sustained damage or have undergone years of exposure to the harsh environment of sea-going ships is a primary task of the Fleet Readiness Center Southwest (FRCSW) metal processing shops in Building 472.

Sandblaster Raul Haro stands with the rear frame to an LM2500 Marine Gas Turbine Engine in the plastic media blast chamber in Building 472. The media blast procedure removes scaling from the component.

"We induct components for refurbishment by taking them down to the bare metal through blasting and cleaning methods and look for signs of corrosion or unusual wear. And we will refer to the non-destructive inspection (NDI) shop as required. After any repairs the components, if needed, are plated then sent to the paint shop," production supervisor Thomas Sapien said.

Many of the finished components are either forwarded ready-for-issue, or sent to kitting for installation, he added.

The shop is divided into four work centers: the blast shop, cleaning shop, plating and metal spray, and employs 26 artisans who encompass a myriad of trades including sand blasters, robotic shop peening mechanics, electroplaters, robotic metal spray finishers, and metal finishers.

"Approximately 60 percent of the parts we induct undergo NDI. In total, that is literally thousands of parts," noted multi-skill metal processing crew leader Robert Frasier.

Removing residues from components is a first step in the restoration process.

"Blast media is used to remove corrosion and can be done using fine granules of glass, metal or ceramic. But the media varies in size depending upon the degree of material being removed from the part and what the part is made of," Frasier said.

"The size of the media we use depends upon the profile of the part. That profile will have certain intensity on the media we use, like a #4 shot peen, which is a little smaller than a popcorn kernel."

Shot peen is typically made of metal or plastic and varies in size to as small as a grain of sand. It is used on a variety of parts including landing gear, turbine disks, and aircraft wheels.

On the rear frame of LM2500 gas turbine engine, for example, plastic media blast is used to remove paint and overspray of edge burn, while the #110 shot peen, is used to prepare the engine's spools and blades.

"Shot peen #110 is slightly larger than sand. We mask areas off and place it inside the blast chamber where we have the blast modules that will rotate the size to what they are to shoot. In this case, they will run up and down the part, and are measured to hit which lines they are programmed for," Frasier said.

The blast shop has five walk-in booths which accommodate large components such as canopies and wind screens. During the blasting process, media blast is vacuumed from the walk-in chamber and recycled.

Smaller components are treated in hand cabinets.

The blast shop processes more than 3,000 components monthly.

From the blast shop, Frasier said that the components are either sent to NDI, the cleaning shop or to plating.

In the cleaning shop, aluminum and nickel-plated parts are placed in a strip tank of alkaline solution, while steel-based parts are placed in a nitric acid strip tank. Afterward they are rinsed in hot water and placed in a dryer.

Steel and aluminum parts typically complete an NDI process before they are forwarded on to the plating shop.

To clean parts that are not compatible with the acidic or alkaline-based solutions, such as plastics and some metals, the shop uses an aqueous degreaser. The degreaser removes oils, grease, plastics, metallic flakes and chemicals.

After components are cleaned, many are plated with nickel, chrome, silver, or cadmium.

Cadmium is an ideal metal for components exposed to a salt-water environment, and may be plated onto steel, copper and powdered metals. It acts as a protective coating to the substrate material.

Cadmium is typically electroplated to a component via an alkaline bath containing cadmium oxide. Afterward, depending on the material it is covering, the component is placed in an oven and baked for up to eight hours.

Ionic vapor deposition (IVD) is used for applying aluminum, steel, brass, beryllium to component substrates mostly for corrosion protection. The IVD may be operated in a vacuum to minimize potential contamination when aluminum coatings, for example, are applied.

The IVD procedure is used to coat steel and copper alloy parts including bushings, springs and bolts.

For larger parts needing plating to a small area artisans use a stylus plating procedure which enables them to apply numerous brushed coatings to the required thickness.

More than 335 parts are processed through the plating shop monthly.

In addition to all of FRCSW's aircraft platforms, customers of the metal processing shop include Naval Air Station Lemoore and Marine Corps Air Station Miramar.

Interns Gain Insight into FRCSW's Additive Manufacturing Program

Three students from the Naval Research Enterprise Intern Program recently spent 10 weeks at Fleet Readiness Center Southwest (FRCSW) exploring the continuing expansion of additive manufacturing (AM) techniques that are used at the command.

Specifically, the students assessed the command's current AM methods to determine any applications toward the Consolidated Automated Support System Operational Test Program Hardware (CASS OTPH), which is used to test avionic components.

Naval Air Systems Command (NAVAIR) is the designer of the CASS OTPH, according to F/A-18 300/400 RIP project manager Guy Newton.

The project was funded by NAVAIR, Common Aviation Support Equipment Program Office (PMA-260) and In-Service Support Center (ISSC) North Island.

"This is actually a project that is a portion of the F/A-18 Automated Test System (ATS) Reliability Improvement Program. All of the parts we looked at are in a development phase in production and we were going back to look to see if we had used AM, what would have been the cost and time savings," said University of San Diego intern Greg Hopkins.

Mesa College intern Kenneth Nguyen said that the team focused on four end user points of the OTPH which interface with the avionics and the CASS station: the interconnecting box, the panel interface device, the test fixture and the accessory set.

In all, 10 prototypes of parts were created using one of FRCSW's 3-D printers. The printers are used in conjunction with Computer Aided Design (CAD) files that are created via 3-D modeling software.

"The 3-D printers work using a bell tray. Once the CAD file is sent the material in the printer will be printed layer by layer, and as each layer is printed, the bell tray drops down until the part is finished," Nguyen said.

FRCSW uses three 3-D printer systems:

- ***Selective Laser Sintering (SLS)*** which uses a laser to fuse powdered materials like glass, plastics and metals, to create a solid structure. The SLS process typically begins from a scanned CAD file.
- ***Stereolithography (STL)*** which uses a liquid ultraviolet curable photopolymer "resin" and an ultraviolet laser to build parts layers at a time. Exposure to the ultraviolet laser light cures and solidifies the pattern traced on the resin and joins it to the layer below.
- ***Fused Deposition Modeling (FDM)*** which uses thermoplastics that are applied in layers via a plastic filament or metal wire that is unwound from a coil to supply material to make a part. The FDM process interfaces with an STL software program to create the part.

"We started with over 200 drawings from different fixtures, and eliminated any that couldn't be printed. The printers have dimensional card limits. The biggest one is approximately 16-by-16-by-18 inches, so anything out of that range we couldn't print," Hopkins noted.

He said that the team also considered if the subject part was load bearing or had mechanical movement that was hard to re-create.

"Once we got our short list, we did an in-depth analysis of each part and that's where our side projects started to come in. These included testing at the materials lab, printing materials research, research on how to use fasteners with additive manufacturing, and how different orientations of different methods effect cost. In turn, that got us to our OTPH final candidates list."

Intern Sara Masjedi from the University of California San Diego said the final list of 63 AM candidates across the four hardware end items were put to a spreadsheet indicating whether or

Students from the Naval Research Enterprise Intern Program pause in Building 94 prior to providing their brief on the feasibility of using additive manufactured parts in test program sets interface designs. Pictured from left are Greg Hopkins from the University of San Diego, Kenneth Nguyen from Mesa College, and Sara Masjedi from the University of California San Diego. *Photos by Jim Markle*

A 3-D printed prototype of an Environmental Control System (ECS) duct for an F/A-18 *Hornet*.

not the respective parts could be a redesign, and if so, the level of difficulty with relevant notes, as well as the current manufacturing price.

Of the 63 parts, 38 were considered simple redesigns or from a direct drawing to print, while the remaining 25 required more complex redesigns such as adding material for stress concentrators, combining assemblies, or a complete change of structure of the part.

"A lot of the initial 200 drawings we looked at were things that we couldn't do like electrical connectors, a lot of wiring," Hopkins noted.

In addition to the difficulty of parts redesign, the team also assessed the materials from which the parts would be made.

Hopkins said that online material data sheets were used as a basis since they hold all of the standard testing and expected results.

"This was put into a flow chart that highlighted the characteristics of each material. If the part being designed comes in contact with some kind of chemical or oil and needs to be Fleet Support Team certified, the designer can look at the guide and see which material is best suited to his needs," he said.

"Switching from traditionally manufactured parts to 3-D printed parts does present a variety of problems" Masjedi said. "There are mechanical properties to consider, fastening methods, dimensional stability, durability, and design guidelines."

In the command's materials lab, the team conducted orientation testing by printing a set of 10 test coupons (five in vertical and five in horizontal orientation) which were tensile tested and then compared to similar Delrin® coupons. The goal was to compare thread strength in both materials and orientations.

Delrin® is an acetal homopolymer which can be used to build parts designed to replace metal.

Vertically-printed coupons all snapped in half; whereas horizontally-printed coupons cracked, withstanding a higher peak force.

For the Delrin® coupon, the screw failed before the coupon, so there was no useful data.

The testing concluded that the threads were most likely strong enough for the applications for which they were designed, like hinge support blocks, but not for repeated assemblies.

One of the components targeted was an air flow adapter on the OTPS from an avionics test set to an F/A-18 *Hornet* fighter.

"We received some two-dimensional drawings of the adapter, and we analyzed its dimensions to see if it would fit in the printer and be able to withstand the loads on it. After we analyzed it for redesign, we made a model using CAD software," Hopkins said.

"It looks a little bit different from its production one because we redesigned it and removed some material and thickened it up and built stand-offs into this part and made it one part. It's actually around four different parts welded together, press-fitted in," he said.

The air flow adapter this was made on the FDM machine in the reverse engineering lab with just over five and one-half of cubic inches of model material, and 100-inches of support material. It took about eight hours to print.

"That translates to about to $28 of model material and about $4 of support material with an hour of setup time," Hopkins noted.

"Currently, when this is made in production, it costs just under $4,500 with lead time and processing time."

Another part, an OTPS holding fixture assembly, was also assessed with the CAD software.

'We eliminated all of the fasteners and beefed it up with ribbing and made it all into one part, and made it thicker and added some stress concentrators," Hopkins said.

"With acrylonitrile butadiene styrene (ABS) it would cost about $400; with Ultem, (a high-performance FDM thermoplastic that expands the use of AM into applications that demand thermal and chemical resistance) around $800. And it would take about 30 hours to print with the FDM," he said.

"We want to identify what kinds of materials we will use for our future designs. We have three new OTPS designs taking off, and we're trying to utilize as much AM as we can for these types of parts," Newton said.

FRCSW recently provided its first AM based assistance to the fleet.

FRCSW engineers manufactured an OTPS retainer made of nylon which holds the connector in into an interface device that supports an E-2C radio.

"We turned it around in about 24 hours. It was part of an E-2C drawing and there were actually 10 others that went with it. We did it for $1.25 and 15 minutes of Autocad," Newton said.

"I took a manufacturing processes class last semester which was a week-long series on 3-D printing. We had a lab where we got to print stuff. We've been stuck in the old ideology that this is only used for prototyping, whereas now it's okay to look at these printers for usable parts," Hopkins added.

FRCSW VRT Repairs NALF Optical Landing System

The Improved Fresnel Lens Optical Landing System (IFLOLS) just after it arrived from NALF San Clemente Island. Rework takes about six months to complete. *Photo by Chuck Arnold*

For more than 40 years naval and Marine Corps pilots have practiced aircraft carrier landings and ground control approach maneuvers at the Naval Auxiliary Landing Field (NALF) on San Clemente Island.

A crucial piece of equipment used in landing exercises is the Improved Fresnel Lens Optical Landing System (IFLOLS). The system is a visual landing aid which uses lights to assist pilots in establishing the proper glide slope when landing on a flight deck or airfield.

When the NALF's IFLOLS was in need of overhaul, they looked to the Voyage Repair Team (VRT) in Building 249 at Fleet Readiness Center Southwest (FRCSW) to handle the work.

"We are the only organization on the West Coast certified to work on this. We will have a mechanic and an electrician to overhaul this system," said lead electrician Louie Napalan.

The VRT provides maintenance for both shipboard and shore-based IFLOLS.

"The difference between shore and ship-based systems are mostly the Stabilized Optic Tables (SOT) inside the IFLOLS system. The ship based IFLOLS system has a ball screw assembly that moves the SOT in relation to the ship's movement using the ship's gyro system. On a shore based IFLOLS, the SOT are fixed," Napalan said.

The SOT contains 12 fiber optic units which houses two 80-watt bulbs each: A primary light and a secondary light that automatically switches over when the primary goes out.

The NALF IFLOLS will be the first overhaul of a shore-based system for FRCSW's VRT.

Modified by the Naval Air Warfare Center under the engineering guide of Naval Air Systems Command, the NALF IFLOLS is comprised of five parts: Unit 1 which houses all 12 SOTs; the datum arms which holds the aviation green lights on the port and starboard side of Unit 1; an electronic enclosure assembly; a transformer enclosure assembly; and the movable trailer.

Napalan said that all of the parts, including the filter glass lenses from the Datum arms, will be refurbished as part of the IFLOLS overhaul process.

"There is service change in process to add a protective coating to the front window lens to prolong their service life," he noted.

Aboard ships, pilots rely on the IFLOLS approximately three nautical miles prior to landing. Otherwise, they use the Long Range Laser System (LRLS) which helps them navigate up to 10 miles away from their landing site.

Napalan said that the VRT also overhauls the LRLS, and that the procedure takes about 200 hours including disassembly, stripping, blasting and painting of the unit.

If the shipboard IFLOLS fails, Sailors substitute the Manual Visual Landing Aid System (MOVLAS), which is not unlike a portable version of the IFLOLS.

The VRT recently overhauled a MOVLAS assigned to Naval Air Station Atsugi, Japan, Napalan said.

"The Carrier Air Field Support Unit (CAFSU) is the certifying entity for all visual landing aids. They visit all of the airfields that have the shore based IFLOLS like China Lake, El Centro and Whidbey Island and certify the IFLOLS aboard aircraft carriers," Napalan said.

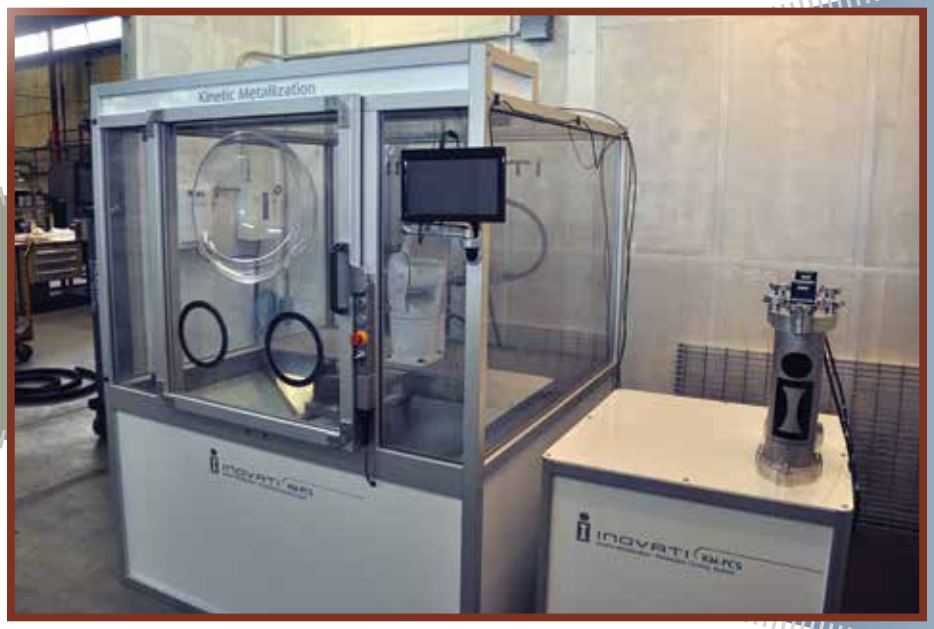
"CAFSU is under NAVAIR and acts as liaison to the carriers, the ships and VRT. They provide the estimates for the ship and then give it to the VRT. After we overhaul the mechanical and electrical systems, CAFSU representatives certify the equipment, and it is ready to be re-installed on the ship."

CAFSU also certifies IFLOLS from decommissioned ships which have been refurbished by the VRT and reissued to newly-built replacement carriers.

Meanwhile, Napalan said that the Naval Auxiliary Landing Field's IFLOLS will take about six months to refurbish and certified and scheduled to be installed in December.

"There are a lot of parameters and systems that have to go in check before launching or landing an aircraft," he said. "People see the movies and TV shows but they don't see this. And I tell our guys that because of you and the quality of your work, you are able to help the pilots go home safely to their families."

"Cold Spray" Coating Process is Versatile, Efficient



The Inovati cold spray machine is used by FRCSW to apply a supersonic coating application of solid metallic powders, ceramics or alloys to avionic components.
Photo by Jim Markle

In its quest to achieve the most efficient resources for production tooling, Fleet Readiness Center Southwest (FRCSW) entered the realm of "cold spray" technology in July.

Cold spray is a supersonic coating application process that uses solid metallic powders, ceramics or alloys that are ground to a particle size of less than the diameter of a human hair.

The process is called "cold spray" because of the low temperature used in the application, which is lower than the melting points of the powders it delivers.

"It is a gun-based system that uses heated helium gas and because of the speed which helium can travel under pressure, it allows the process of kinetic metallization by feeding a very fine metal into the stream," said metalizing operator Harry Simpson.

"Depending on the type of powder, there's a certain amount of heat that can be applied that allows it to warm so it travels through the nozzle picking up speed the whole time. As soon as it hits the part, the metallization process happens because it's traveling so fast that it adheres itself to the metal."

FRCSW primarily uses aluminum, nickel and chrome in its cold spray processes.

The apparatus is manufactured by Inovati, and the command is the only FRC to operate one.

The system is automated and features a graphic user interface about the size of an i-Pad® which controls pressure, temperature and the powder feed rate to the part. Parts may be sprayed continuously or coated in layers.

As it's used the equipment also generates a data log of parameters that can be used to identify issues in a coating or repeat a coating at a later date.

Simpson said that not only does the cold spray machine apply coatings to parts it can also be used for stripping or blasting.

"We blast the surface to prep for metalizing and use nitrogen because it's a cheaper gas than helium. Most people (in industry) would use compressed air, but that would result in moisture on the part. Nitrogen is very clean and dry, whereas helium is a much lighter gas," he said.

Blasting agents vary but are indicated by the local engineering specification for the particular part.

"You could blast steel, stainless steel, or titanium. But the powder that is applied is what makes the difference," Simpson noted. "It depends on the characteristics that you are trying to achieve. Some powders have characteristics for great wear, some for heat, some for corrosion; every powder is different. And it depends on what type of environment you are putting the part in."

The cold spray process is exclusively being used on three aluminum and titanium parts from the legacy F/A-18 *Hornet* line: the aircraft mounted accessory drive (AMAD) housing, the brake carrier housing and the AMAD gear shaft.

Simpson said that a significant advantage to the cold spray process over the standard flame spray, or plasma spray, is the amount of time required to plate a component.

"The (Hornet) parts are pre-machined before I get them. There's a wall thickness they are after. The masking is the same, the tooling is the same. For the AMAD housing for example, it would take me about three hours for blasting and cold spraying whereas the current process takes about 10 hours," he noted.

"Before, I would have to spray after blasting that by hand. The gun is 13,000 degrees and its six inches away and spraying on aluminum with a fiberglass tape on a flat surface, so I was constantly battling the heat and that environment. But now, I just input the information."

The cold spray application may potentially be applied to parts that have never been able to be plated due to the absence of a workable plating process.

"I think the cold spray is going to do good things. It's going to save parts that we've never able to save before, and that will save the Navy a lot of money," Simpson said.

The replica Curtiss A-1 *Triad* is reinstalled on its pedestal in Curtiss Park after damage to one of the struts was repaired. The A-1 was the first aircraft type purchased by the Navy in 1911 from Glenn Curtiss, and the ¾ scale model was originally built by FRCSW artisans and installed to commemorate the Centennial of Naval Aviation in 2011. *Photo by Scott Janes*

F/A-18F *Super Hornet* F-079 is disassembled at its Y383 bulkhead in Building 378 where it will be used to splice with the nose section of Super Hornet E-060. The latter was involved in a mid-air collision with another `E' model Super Hornet in 2010. The splicing procedure is the first ever, and will require approximately one more year of work before completion. *Photo by Jim Markle*

Fleet Readiness Center Southwest (FRCSW) Commanding Officer Capt. Timothy Pfannenstein is joined by members of the FRCSW Industrial Environmental Division July 10, 2015, in Building 94 to recognize the command's selection as the FY 2014 Chief of Naval Operations Environmental Quality Industrial Installation award winner. *Photo by Jim Markle*

CPO Selectee from FRCSW Det Pt. Mugu Visits USS Constitution

By ATC Select (AW/SW) Amanda Dietzel

As part of CPO 365 Phase II, 60 Chief Petty Officer Selectees stationed all over the world met up at USS *Constitution* to engage in activities including shipboard drills, cannon drills, rowing exercises, and community relations events I had the distinct privilege of attending. We toured a Homeless Veterans Shelter meeting with veterans and hearing their stories, toured Paul Revere's home, and participated in a community relations event beautifying an elementary school for the upcoming school year.

CPO Selectees pose in front of "Old Ironsides." *Courtesy Photo*

We marched all over the streets of Boston proudly singing cadence and "Anchors Aweigh." One day we marched on board a U.S. Coast Guard Station singing "Anchors Aweigh" to show them how it's done. We got to meet Thomas Kelley, a Medal of Honor recipient (and Vietnam War veteran), who remained on active duty after suffering a head wound and losing an eye. He never gave up and continued to command his ship even after he was wounded.

CPO Selectees traveled from all over the world to share their Naval pride and heritage at the home of the USS *Constitution*. *Courtesy Photo*

USS *Constitution* was originally manned by 450 men who worked 20 hour shifts. "Powder Monkeys" were Sailors, some as young as seven years old, who ran the powder from the storage locations to the cannons. The small size of the boys allowed them to easily retrieve the powder from the cramped storage spaces. There were two cooks onboard, and only one was allowed to cook for the Captain; the other cook was responsible for feeding the rest of the crew. The large crew enabled them to seize and take command of other ships without losing their operating potential.

The overall length of the USS *Constitution* is 305 feet and it displaces over 1,900 tons. It took three attempts to launch her because the displacement was not accounted for. She has over 44,000 square feet of sails (over one acre), and her top speed is 13 knots (approximately 15 miles per hour).

"Old Ironsides" is plated in copper, and when she comes out of dry dock in 2018 new copper will be laid. Currently, the Constitution Museum is letting tourists etch the copper. I etched "FRCSW Det Point Mugu" on the copper so our command will be part of Old Ironsides for the next 20-25 years. She is a remarkable ship that is well worth a trip to Boston. It was the experience of a lifetime.

USS *Constitution* at Pier 1 in The Boston Navy Yard. *Courtesy Photo*

Fleet Readiness Center Southwest

Mission & Vision

Mission

We generate readiness through timely and responsive production of engines, aircraft, and components for the warfighter.

Vision

To be the premier maintenance repair and overhaul organization in the Department of Defense by providing the best value, highest quality, and most reliable products.

FRCSW is a cornerstone of future Naval Operations which we achieve through a highly capable workforce and robust community partnerships.