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Marine Engine Troubleshooting Air Starting Systems

Bishal Das -B.Tech-IV

A ship's main marine diesel engine is started on compressed air that is controlled by various components of the air start system. It is a well-tried and tested reliable system, but it can go wrong if not properly maintained.

The following sections examine a typical air start system, with the first section providing an overview of the system.

Overview of System

The air start system looks rather complicated, but it is quite simple when you examine it without the safeguards. These are put in place to prevent such occurrences as starting the engine without having a signal from the engine room telegraph, trying to start the engine with the turning gear engaged, or trying to start ahead when the telegraph asks for astern. There are also safety systems incorporated such as a bursting disk and numerous non-return valves in the event of a leaking air start valve.

The next section lists some of the problems that can be encountered when maneuvering.

Problems in Air Start Systems

We shall look at two common problems encountered when maneuvering the main engine: not starting and starting in the wrong direction (reversing instead of starting ahead).

Not Starting

As we have seen, there are various interlocks in place to prevent the engine being started until certain criteria are met. If the engine won't turn over on air, the bridge should be informed; then the following checks should be carried out.

1. Check air start supply valves from air receivers are open and that the pressure is 30 bar.
2. Check that the turning gear is disengaged
3. Check that the turning gear and telegraph solenoid valves have actuated. This will supply air to the automatic valve, air distributer, air manifold, and air start valve.

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These are the initial checks that can be quickly carried out. If these are all satisfactory, then the problem lies in the controls ahead/astern solenoids. The air distributer or the air start valve itself may be stuck in the closed position. The ship will need to anchor or be towed alongside for these checks to be carried out.

Engine starts in wrong direction

If the engine starts in the astern instead of ahead direction, the following checks should be carried out.

1. Ensure the air start control moves to reverse mode at the control station. This is a visual check and can be observed when the telegraph rings from ahead to stop then astern. If this does not happen, the solenoid valve may be stuck.

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RLINS Sports Day Events

Mr.M.Subramanian, Advisor-Technical Inaugurated Cross -Country event on 15th Feb, 2019. Also seen are Mr. A. Porchezian, OIC, Mr. Bahaskar Agnihotri, Principal Mr. M. MariThangam, DPE, and Cadets of RLINS.

The Team Participating in the Shuttle Cock Final Match for the Faculty. (F-L)Mr. M. Marithangam, DPE; Mr.Chandran Murthy, PRO; Mr. B. Meenakshi Sundaram, A.O; Mr. S. Balaji, Faculty; Mr. R. Ramasamy, Instructor Ship in Campus.

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2. The oil and air supply to and from the reversing valve should be checked. A blockage of either will stop the reversing servo motor operating and allowing change over from the astern to ahead position.

This again will take further investigation, so the ship should anchor or remain tied up to the quay.

As this ahead/astern changeover is controlled by lube oil and compressed air and it is interlocked with the fuel pumps. These are the usual culprits and the starting point for a thorough investigation. I have experienced this situation only once and fortunately we were leaving port and still tied to quay by stern spring. Once the bridge was informed, a rope from the fo'c'sle was thrown ashore and made fast. This gave us the chance to check for the fault, which turned out to be the oil supply from the crosshead oil supply pipe being blocked.

As I have said before, the maintenance of the air start system components is paramount to the operation of the system.

Main Components of the System

Air supply system

- Two air compressors
- Two air start vessels
- Numerous non-return valves
- Numerous drain valves

Control system

- Turning gear out sol v/v
- Telegraph signal sol v/v
- Automatic valve
- Ahead and astern change-over
- Air distributer
- Air start valve

Anti-explosion components

- Air supply to manifold from air vessels non-return valve- this prevents hot gasses from returning to air receivers.
- Air manifold pressure relief valve – this operates if pressure rises due to heat from gasses.
- Air supply to air start valve bursting disk – this disk ruptures under increased pressure caused an air start valve leaking back.

Mandatory Safety Precautions

Before we get into the operation of the system in the next section, this is an opportune moment to make a closer examination of the precaution against explosion, which is a very real threat even in today's modern engines that incorporate the latest in engine management systems.

- Compressors

The compressor air inlet filters should be positioned in an oil-free zone, i.e. no oil fumes should be present.

The compressed air supply lines to the air receivers must be protected by non-return valves.

- The air receivers

There are two air receivers, linked by a common discharge pipe to the system. The air from the compressors will contain oil and water (there is no way around this). This mixture ends up in the air vessels as a mist, eventually settling to the bottom of the vessel. It is imperative since the mixture should be drained from the vessels after every charge, and regularly when maneuvering. The oil also coats the internal of the supply pipes; this too can be reduced by draining the air vessels.

These actions, as well as checking by hand for heat in the air supply pipe between the air start valve and the air manifold, form part of the watch keeper's duties. Any excess heat here, and the fuel and air to that particular cylinder should be isolated, and the bridge made aware of the situation.

Before we leave the precautions, there are many examples of air start system explosions. One of the worst ones occurred on the MV Capetown Castle, killing seven engineers. Lloyd's register recorded 11 such explosions between 1987 and 1998; all down to oil gathering in the receivers and piping and ignited by exhaust gasses. One in a year speaks for itself: drain the air vessels regularly and maintain the system.

The Operating Principles of Marine Engine Air Start Systems

1. If in port, ensure turning gear is not engaged.

2. Open both air receivers' isolation valves and start up a compressor to fill receivers to maximum; drain oily water of reservoirs and also from dead leg on supply pipe work.

3. This allows the compressed air to flow as far as the turning gear solenoid valve. Provided the turning gear is disengaged, this will allow the supply of air at 30 bar to

the automatic valve passing though the non-return valve and into the manifold. From here the air is piped to the air chamber in the air start valve. (This is the pipe that will get hot if you have a leaking air start valve.) The valve is held in the shut position by the spring tension.

4. When an ahead or astern movement is rung and answered on the engine room telegraph, the telegraph start signal sol v/v is activated allowing air to the ahead and astern solenoid valves mechanism.

5. The air is now directed to the starting air distributer that is fitted on the end of the camshaft. This enables it to select the appropriate cylinder(s) to supply air . This will be the relevant cylinder that is just passed TDC and on the downward stroke.

6. The air from the starting air distributer is at 30 bar, and this is injected into the air start valve top piston. This overcomes the spring tension and forces the piston downwards thus opening the valve and introducing the air at 30 bar to the cylinder(s) having been supplied earlier to the air chamber.

7. Depending on the engine make and model, air can be supplied to several cylinders to assist starting. A "slow start" supply can be used if there has been a lapse of half an hour between movements when maneuvering.

Maintenance of System Components

- Compressors

Regular inspection of filters, suction and discharge valves, as well as piston and ring checks should be performed at the manufacturer's recommended periods. Intercooler tube nests should be cleaned ensuring optimum air flow.

- Air supply Manifold Relief Valve

This should be regularly inspected to ensure that the spring is operating correctly, with the complete overhaul being to manufacturer's instructions.

- Air Start Valves

This is the most important component and if not maintained, will begin to stick due to a weak / badly adjusted spring or worn piston rings allowing hot combustion gasses into the compressed air piping.

The valve should be replaced regularly with an overhauled and tested spare, the spare then being stripped and spring, pistons, and rings inspected. The valve is ground into the seat using fine lapping paste before rebuild and bench pressure testing.

Courtesy :Willie Scott / Marine Engineering

The British-French Joint Aircraft Carrier Project

Hemant Attreya - B.Tech-III

The British-French Joint Aircraft Carrier Project

Aircraft Carriers in the 21st Century

Since the Second World War, aircraft carriers have been the cornerstone of the navies of major powers. Their unique ability to provide mobile, sovereign territory to any ocean or international waterway and extend an umbrella of friendly air cover over a region several hundred miles in diameter has made them an indispensible naval asset in almost every major conflict since 1940.

The threat environment for aircraft carriers has become increasingly dangerous as guided missiles and stealthy submarines were adopted by nations that lacked carriers of their own, and the improving lethality of such weapons means that older aircraft carriers active in the 21st century are becoming more and more vulnerable. Every navy with aspirations of regional dominance either has or is trying to acquire modern aircraft carriers and longtime carrier operators like the United States, Britain, and France are all beginning work on their next generation of flattops.

Image Courtesy: US Navy Archives

Britain and France in particular have unique histories when it comes to aircraft carrier design and use. Britain led the way in the pre-World War II period when it came to carrier design, and was challenged only by Japan and the United States in this crucial field of naval engineering. But by the end of the war Japan was no longer a naval power and Britain's empire was rapidly disintegrating. The Royal Navy shed carrier after carrier – often selling them to nations like India or Australia – and by 1979 Britain retired its last big carrier, replacing it with the three baby carriers of the Invincible Class. France, with its military industries ravaged by occupation and war, was late to the game. By the early 1960s, it operated two carriers of indigenous design, and by the early 21st century they were replaced by the Charles de Gaulle, the only nuclear powered carrier not operated by the United States.

British-French Carrier Replacement Requirements

The de Gaulle had a troubled development history and took many more years than anticipated to resolve major construction defects. Before she even became reliably operational, France had sold its only other carrier to Brazil and could only keep a carrier at sea for part of any given year. Two of Britain's baby carriers were retired between the end of the Cold War and

Image Courtesy: US Navy photographer Robert Barker

2011, leaving only the aging HMS Illustrious to lead the fleet. So as the second decade of the 21st Century began, it was clear to both France and Britain that new British aircraft carriers and new French aircraft carriers would be needed around the same time. This realization led to a cooperative effort on the part of the two nations to develop the first British-French carrier in history, and in fact the first aircraft carrier to be designed by two nations working together to achieve mutually supportive goals. European nations had cooperated on a number of military projects during the Cold War; the Jaguar fighter, the Tornado attack aircraft, the Alpha Jet, the Eurofighter Typhoon, and the Eurocopter are flying examples of pan-European cooperation. A number of missile projects were undertaken jointly by European powers including the Milan and HOT anti-tank missiles, and the Roland surface to air missile. Even the MEKO family of warships, though built by Germany, was designed for NATO and allied nations with the input of the buyer nations.

But an aircraft carrier is a different animal altogether compared to a missile or jet- the joint design proposed by Britain was to displace over seventy thousand tons and operate several dozen combat aircraft. Such collaboration would require significant efforts by both sides to suppress long standing national preferences in naval design, yet produce a class of new British and new French aircraft carriers that would be capable of withstanding 21st century threats.

The Power Plant Issue

Sticking points in the design process emerged quite soon after formal cooperation began. A major problem that had to be resolved was the form of propulsion to be used by the new British-French carrier design.

Britain has never taken efforts to utilize nuclear power plants in any of its vessels save for submarines. Nuclear power plants are highly efficient and do allow a vessel to operate without refueling for years at a time. But there is a high cost associated with nuclear reactors, both in terms of initial investment and certain design redundancies that must be in place to protect the power plant from a meltdown due to accident or damage. Nuclear reactors, as evidenced by Chernobyl and Fukushima (not to mention known and possibly unknown events in the United States) are always at risk of failing if they cannot be cooled. Ambient radioactivity must also be monitored and adequate shielding installed to prevent long term exposure from affecting the crew. And reactors require specially trained personnel to ensure they are maintained and operated safely.

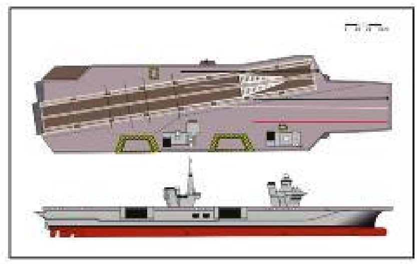

Image Courtesy: Wiki User Rama

But France used and continues to use nuclear power in its submarine as well as the Charles de Gaulle, and it had become a point of pride for France that it maintained the only nuclear carrier that wasn't American made. Much as France maintains its own nuclear deterrent as a point of national pride, it came to view using nuclear power in its carriers to be a statement, and that moving to conventional power would be a technological step backwards for the French Navy.

Though not a deal breaker, the argument over propulsion decreased French interest in the program, and contributed to its ultimate failure.

The Collaboration Disintegrates: Sarkozy Pulls France Out

The full reasons for the failure of the British-French carrier project will likely never be known, but certain aspects of the failure seem clear.

Image Courtesy: Jean-Michel Roche

Timelines are difficult to coordinate between two major bureaucratic organizations within a single country, and trying to sync the needs of two different countries is nigh impossible. After the retirement of Foch and its sale to Brazil, only the de Gaulle is left to provide carrier air cover for French fleets.

But lingering flaws require it to spend the better part of two years out of every six years in drydock for repairs – and this is in addition to the normal maintenance downtime needed by big naval vessels. A new French aircraft carrier was authorized in the 2008 defense budget and was likely hoped that a new carrier could enter service by the next time the de Gaulle went in for its long maintenance. But Britain, though originally hoping to bring its first new carrier online in 2014, pushed back that date to 2020. If accompanied by delays in the design itself, this may well have dimmed French hopes for a push to return to its two-carrier fleet standard.

Finances are also likely a key player. The 2008 financial collapse and the ongoing turmoil in Europe due to a probable Greek default on its debt has made any major military expenditure a risky proposal. French President Sarkozy, upon pulling out of the British-French aircraft carrier project in 2008, cited the desire to use nuclear power as a key point against continued collaboration. But a simpler explanation is that in an era of budget cuts, France is having to rethink its carrier fleet and consider maintaining only one for years to come.

If budgets remain tight, and Britain holds to its plan to keep the HMS Queen Elizabeth as its only active carrier with her sister, HMS Prince of Wales left in reserve, it is not inconveivable that France could decide to maintain one carrier and trade off deployment duties with its NATO partner, Britain.

Sources: The Sunday Times: President Sarkozy Ditches Franco-British Carrier Project

Few Thoughts about IC Engines

Samarjit Sen - B.Tech- I

today's world ,every one drives either a car,or a bike; howdoes it work? just we have to push the pedal and the car will run with a greater speed . It's an internal In combustion engine (ICengine).which is the heart of an automobile . Some informations about IC engine are listed below. The internal combustion engine is a neat engine which uses a fuel combustion to produce the motion .

IC engine is classified on the basis of:-

1. Ignition

Standard Ignition

Compression Ignition

2. Fuel

Single fuel

Double fuel

Multi fuel

3. Working stroke

Two stroke

Four stroke

Now a days, the IC engines have different parts.

But mainly all parts are identical to each other and having the same main parts;

1. Piston
2. Piston rings
3. Piston rods
4. Connecting rod
5. Crankshaft
6. Crankcase
7. Valve
8. Sparkplug
9. Fuel injector
10. Cylinder Head
11. Crank
12. Flywheel

All these parts are connected to each other , but still there is a question ;how it works, it works in four stroke namely :-

1. Suction stroke
2. Compression stroke
3. Power stroke
4. Exhaust stroke

The IC engines have many app. In today's world it is most commonly used in automobile. , agri., shipping, power generation.

But, this long story might have come into the world with a priceless contribution of a few geniusminds such as:

1. Diesel:- Rudolf diesel
2. Petrol:- nikolaus august otto

Raja Raja Cholan - Tamil King and Maritime Adventurer

S.Thiagarajan - Faculty - RLINS

The man, who laid the foundation of the Chola Kingdom into a mighty Empire, is none other than Rajaraja cholan the Great (985-1014 C.E.). A patron of arts and religion, he was also an organizational and political genius. You may wonder why the King Raja Raja Chola takes prominance in this article related to marine field? The answer is, Yes, our King Rajaraja cholan was a maritime adventurer and achiever, who possessed great Navy and sailed through sea routes to the various places in the world. He and his wise mariners established the Powerful and Scientific way to cross the ocean without the use of any modern technology . More than 1000 years ago, they made remarkable achievements in the realms of sea faring than what we are doing with the present Technology. So I took the privilege to say about our King Rajaraja Chola to all the budding mariners.

Let me share a few informations about the glorious emperor Raja Raja Cholan (947 to 1014 AD),. He extended his empire to almost a third of modern day India, including Sri Lanka. He developed effective systems of administration, conducted land surveys, built several temples, some withstand even today. He was a great patron of the arts and culture though not many scripts survived the subsequent foreign invasions. Rajaraja started a naval fleet with a rich maritime heritage which dominated the region for a century and only resurged in modern day independent India.

The Bragradeeshwara temple, an UNESCO world-heritage site, at Thanjavur in Tamil Nadu was built by Raja Raja Cholan over a thousand years ago.

Raja Raja Cholan's son, the great Rajendra Cholan-I continued in his father's footsteps, and took the naval expeditions even farther, establishing outposts and a strong Indian cultural influence in the Andaman islands, Cambodia, Thailand, Indonesia and Laos. He established a pathway for Indian business with China. This was a time when Indian influence was strong in South East Asia, as can be seen by the Angkor Wat temple in the Indonesian island of Bali. Rajendra Cholan also directed an assault on Srivijaya, which is now called as Jakarta.

One of the types of maritime craft used by the Cholas was the 'kattu-marams' which mean 'bound-logs' and these were shallow water craft used to transport crew and cargo from shore to the anchorage. The kattu-marams form the origin of the current maritime fast-boats- the catamarans! The larger ships in the Chola fleet were called sangara and colandia. The colandia were larger ocean ships which could navigate the large seas.

There is little visual description of ships used by the Cholas, though this relief at Borobudur, Indonesia from that period gives an idea how it must have looked.

The Cholas used navigation instruments such as the "Ra-p-Palagai" (for star-sights), the "Tappu-Palagai" (for speed measurements), the human hand for measurement of the altitude of the stars, flat-bronze plates (for measurement of the depth of water), and pigeons for the sighting of land.

The passages planned in those days were carefully prepared, and were undertaken only under favourable winds and currents. As these ships did not have magnetic compasses and rudders, the navigators mainly relied on the positions of the stars, winds and currents and were able to make a clear passage from the East Coast of India to the Malacca Straits or the Sunda Straits.

The Chola naval strength began to decline after five generations of Chola power, and a new era began with Vasco-da-Gama arriving to Kozhikode in 1498.

The modern day navigator is much at ease compared with the mariners of that era. They managed to ply their trade without a GPS, and modern day facilities. They did not even have charts, echo-sounders or radars. They used their senses, their common-sense and strong will-power to sail past their horizons. So can you and also me!