MENTOR

1st Year Anniversary
Special Offer

KNOWLEDGE MULTIPLIES IN SHARING

SEPTEMBER/OCTOBER ISSUE #7

ELECTRICAL ENGINEERING
SUBMARINE

COMPUTER ENGINEERING
AERIAL MAPPING UAV

MECHANICAL ENGINEERING
ROCKET ENGINE

Mentor Tricky Questions

With

each DROP

of your

Knowledge,

we

will create the

ocean.

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Vision & Dedication

MENTOR Magazine is dedicated to all High School and College Students as well as Graduates. It envisions to disseminate academic knowledge on various disciplines through sharing

Policy

MENTOR Magazine is an academic and scientific publication, produced and published by the Mentor Volunteer Group at the Eritrean Scientific Society. This magazine is absolutely free and not intended to be sold. Any contravention against this policy will entail legal consequences

Contents

EDITOR'S LETTER

Dear readers we are celebrating our 1st Anniversary with this edition of mentor magazine. Mentor magazine is the first of its kind with the sole purpose of promoting Education and professionalism in our generation. We aim to impact the lives of many young people who are currently joining the work force or higher education. We strive to promote the works they have done and their potential within the professions of their choosing. Mentor magazine is the perfect medium for exposing your potential and start to build your reputation. It has already been a year since we started this journey and it has been a blast. We have featured over 50 articles in all the 10 editions we have put out. We have given the platform to more than 150 students to get recognised for their work and it was an honor for us. In this edition also we are featuring 3 engineering topics and additional aiding tips.we strongly believe in sharing as well as feedback, so don't be shy to tell us what you want us to improve for the future.

Editor-in-Chief

Saba Tekeste

SUB-MARINE

- TEKIE TADESE
- AMEN KIBREAB
- ROBEL MENGSTEAB
- ABEL HAGOS
- MILKIAS TEWOLDE
- SOLOMON W/GERGISH

INTRODUCTION

These underwater exploring vehicles are generally known in the world as ROV (remotely operated underwater vehicle) but to avoid confusion and for simplicity, we chose to call it CCUEV(computer controlled underwater exploding vehicle)

In many applications robots are operating accurately and reliably than humans, and cheaper. Specifically in offshore and marine industry, human operations are limited due to the constraints on the operation time, accuracy risks, and pressure under the water. During the last 30 years the need for oceanic cartography, sea exploration and under-water oil extraction has led to the creation of an underwater vehicle that can be controlled from distance. Generally remotely operated underwater vehicles (ROVs) are tethered, highly manoeuvrable underwater robots driven by an individual on the surface. These robots are tethered by a series of wires that send signals between the operator and the ROV from a distance. All ROVs are equipped with a video camera, propulsion system, and lights. Other equipment is added depending on the specifications required.
A typical commercial ROV will have some or all of the following attributes:

- Surface-based operation
- Video cameras and lights for observation
- Cables (commonly known as tethers) for communication to and from the operator on the surface, and power from the surface
- Motors fitted with propellers for propulsion and positioning (known as thrusters)
- Sensors for depth and orientation, and others.

APPLICATIONS

- By using our prototype one can reduce the cost for a fully equipped diver.
- Marine colleges equipped with ROVs will have upper hand in relating theory with reality so also essential for Educational purposes.
- It can also be used for accidents expedition in dams.
- To monitor the maintenance of Dam destruction
- Naval engineering studies and for the research of marine life.

AIMS WHEN BUILDING THIS SYSTEM (CCUEV)?

The many varied aspects of this project present quite a number of challenges and learning opportunities:

- Design and construction of an indigenous CCUEV
- The installation of an electronic DC motor drive system
- Design and construction of a water - proof enclosure for underwater vehicles

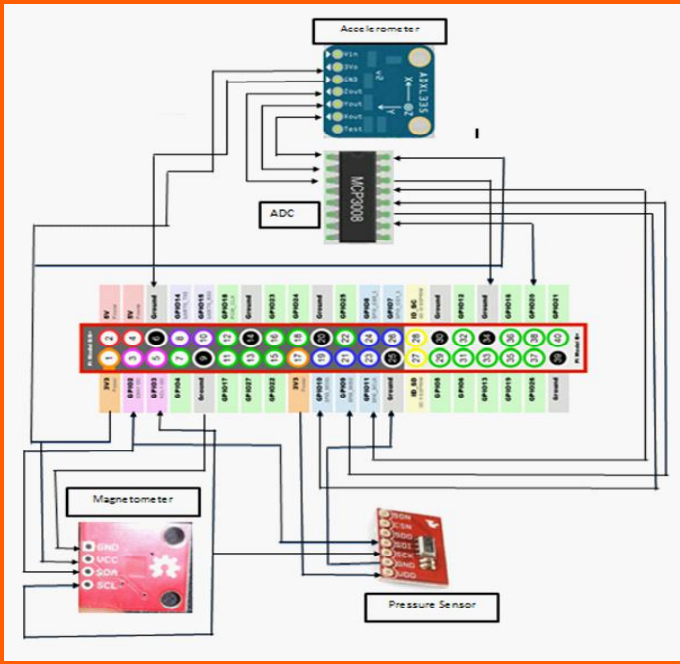
PARTS

MICROCONTROLLER

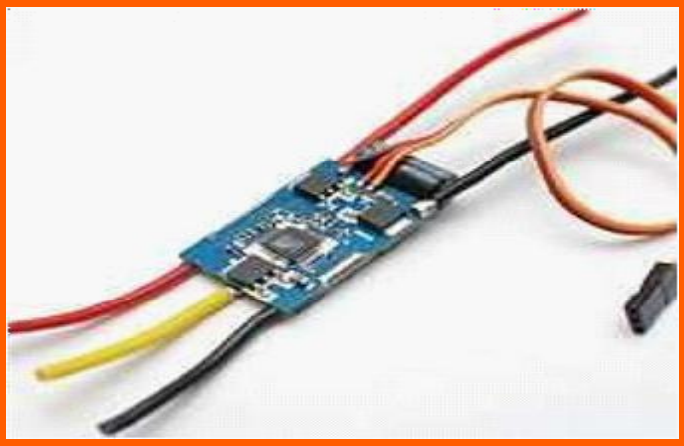
Raspberry pi model 3B with camera mounted

SENSORS

Magnetometer
Accelerometer
Pressure sensor



Electronic speed controller (esc)



MOTOR

1000kv brushless dc motor

HOW IT WORKS

The system is a tether type which is controlled by a computer using an Ethernet cable.The user can be on a boat or on a land near sea.The manoeuvring of the system is achieved with the help of four brushless motors. The ROV has an on board camera for monitoring and recording the underwater life. Once the CCUEV submerges in water, it is hard to determine which direction it is facing and due to external effects or during manoeuvring the orientation may disturb, but with the help of sensors-(magnetometer and accelerometer) its rotation about its vertical axis (yaw) can be determined in degrees and the it can maintain stability or orientation with the help of the motors (horizontally mounted&vertically mounted) respectively. The barometric pressure sensor is used for underwater purpose in our case, so it will be used for depth measurements underwater. It keeps track of every change in depth of the vehicle, and provides a digital output for each change.sowhenyouwantthe system to maintain a constant depth, the vertically positioned motors increase or decrease their speed according to the feedback from the pressure sensor. Unlike other DC motors, brushless DC motors need Pulse Width Modulated (PWM) signal in order to run. So they require brushless ESC which generates this PWM. The PWM are of the same frequency but with different on off time. In order to increase or decrease the speed of the brushless motors, you have to give a proper command to trigger an equivalent Pulse Width Modulation (PWM) to drive the motors to the needed speed. The motors are not designed for underwater purpose but it is possible to use them, as they are brushless there is no possibility of short circuit of brushes in salt water and the coils inside are perfectly insulated.

Raspberry-pi microcontroller is used in CCUEV to do all the tasks inside the system. All the sensors, camera, brushless ESC's… etc are connected to the microcontroller and there work is centrally controlled by this Raspberry-pi. In order to do this functions, we use python language to program the microcontroller. The pi is basically a small computer with with usb, hdmi, audio jac and Ethernet cable connector and you can install whatever os you want (armv compatible).

SHAPE DESIGN

The model has a cylindrical body (PVC)that houses the whole components with a transparent glass in its front where the camera will be located. The four thrusters would be placed on the wing-like structures (two on each one, facing two axes) for movement. The thrusters are mounted inside smaller diameter PVC pipes that were moulded into the body. This is done to help protect the thrusters from damage if the CCUEV gets too close to a wall or encounters any objects or debris. The proposed design is implemented using certain calculations that are used to determine the proper proposed design of the computer controlled underwater exploring vehicle. The goal is to be as hydrodynamic as possible, but keeping the stability and the ability to add components. The body should have the ability to place parts as close as possible while leaving the space for specific additions. The presence of the side-wings is to hold the surge and heave motion providing motors. The flat surface area of the wood structure in the side of the wing is to provide a float and an upright motion of the CCUEV during heavy current when the object is submersed. Also the Trapezoidal shape of the wooden structure or the side wings is in a way that it's bent giving a sliding shape that provides the flow of water to the external structure to slide easily so that the opposing force being applied to the CCUEV model is minimized.

CONCLUSION

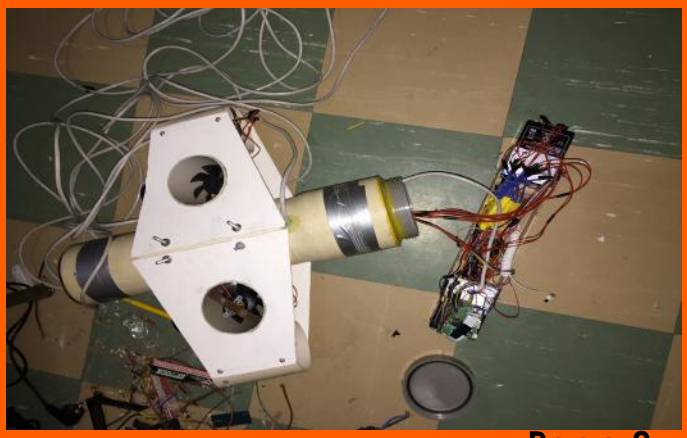
This project started with the overall goal of combining personal interests and newly developed skills, to produce a potentially useful device and one that can help us bring the theory we learned into practice, whilst presenting as many realistic challenges as possible.

The aim of this project was to design and construct a small scale ROV. In order for the project to be successful, all the right parts and components had to be found and put together properly. This was one of the parts during the whole process and took most of the time and effort.

The output of the computer controlled underwater exploring vehicle was successful in such a way that it was able to submerge and follow the desired trajectory however some disturbances like currents were not encountered. To search and program all the sensors on the raspberry pi was a difficult task since all the components were not specifically designed for it.

Careful and symmetrical placements of the mechanical components were made for stability so this project included some trial and error tests to meet the required needs.

The project has a lot of space for further improvements as those that will be mentioned in future enhancements. Therefore, the main goal, constructing and controlling a small scale indigenous ROV, can be considered as accomplishment.



FUTURE ENHANCEMENT

Throughout the entire project, many possible improvements and additions were envisioned, and suggested by others. Many were taken on board, however many more were considered to be simply beyond the scope of this project. Following the completion of this phase of the project, it is hoped that many of the following ideas will be examined for implementation:

1. Environmental sensors e.g. water salinity
2. Pan-and-tilt for camera
3. Manipulator
4. On-board battery monitoring
5. Longer tether
6. Fibre optic data link
7. Obstacle detection
8. Autonomous operation
9. Sonar

OBSTACLES FACED

The main problem that any one faces during a project is the materials needed for the construction of the model. Most of the materials are purchased from outside this country and takes time till it reaches here. Coming to CCUEV, we have done additional studies for the mechanical design that asks more time for understanding the concept and calculations. We also had problems finding people who would help us to test it in real life applications, but later, thankfully, some people did.

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SUB MARINE WITH ITS CONTROLLER PC

Aerial Mapping UAV

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CONCEPT OF UAV

- A UAV drone in general is a small flying machine that is controlled remotely by an operator on the ground using radio transmitter

INTRODUCTION

- The aim of this project was to create a fix wing unmanned aerial vehicle "UAV" capable of flying under the remote control of an operator and take aerial photographs.
- We use a Technique called Photogrammetry.
- Building a Flight controller with multiple sensors.
- Navigation algorithm will be the main Challenges of this project.

PROBLEM DEFINITION

The task of creating work site map is

- A time and manpower consuming requirement of many civil construction projects.
- The added work load to update the map with time can slow down the progress of the project.
- One solution to this problem is to employ the use of UAV to map the work site using Photogrammetry.

THE SUCCESSES OF THIS PROJECT

- The successes of this project will depend on building the computing hardware need to fly and control the unmanned aerial vehicle and successfully interface it to the mechanical drive system. Achieving this goal will require working on both hardware and software aspects that involve a
- Rudimentary network coding
- Sensors interfacing
- Telemetry data processing
- Telemetry data display
- Graphical user interface

EXISTING SYSTEM

- Phoenix aerialsystems only available in USA and Canada for leasing at high cost.
- Other mapping technology such as Satellite and Manned aircrafts have a very high operating and setup cost to produces the same results.

DISADVANTAGES OF EXISTING SYSTEM

1. General availably lack of the technology for most of the world
2. High operating cost for the same results.
3. Import restriction

SCOPE OF THE PROJECT

- The scope of this project will be limited to building the physical body and the computing hardware need for flying the UAV. This include

1. Building Flight controller and navigation system
2. Communication system between the ground station and the UAV
3. Telemetry Data Visualization for ground station
4. Coding navigation algorithm

ADVANTAGES OF OUR PROJECT

- Low build cost
- Low operating cost
- Recycling of consumer electronics
- Easy to deploy
- Short mapping time

POSSIBLE APPLICATION

- rapid mapping of work site
- rapid production of elevation map
- rapid survey of work site

POSSIBLE INDUSTRIAL APPLICATION

- Civil construction projects
- Military Site Survey
- Mining Site Mapping
- Farmlands survey

CHALLENGES OF THIS PROJECT

- **Building the physical body of the UAV**
- Building the computing hardware using arduino
- interface sensors and wireless links
- Creating a triggering or interfacing mechanism with consumers digital camera
- Creating the algorithm for the navigation and stabilization system of the UAV
- Creating stable data transfer link between the ground station and the UAV over 1km in rang
- Creating the programs for telemetry data Visualization and remote control
- Building the system for 300 $ or less

SYSTEM DESIGN

The main purpose of our system is to create a fix wing unmanned aerial vehicle "UAV" capable of flying under the remote control of an operator and UAV with the capability of taking aerial photographs. This will be achieved using an Ardiuno mega based flight controller and Ardiuno Nano for ground control commands input processing. The flight controller will be responsible for the control of the UAV in flight by performing IMU data processing, processing the ground control commands for remote control and telemetry data transmissions to the ground control station.. The payload of this UAV will include analog video camera pointed to the ground at an angel with a video signal transmitter. The video signal from the UAV will be received by the ground control station through a video link and digitalized and feed to a computer for data processing and FPV control of the UAV. that can be view through any media player like vlc.

Every part is crucial to the system and was designed thoroughly before the system development process begins. Thus we divided the development process into the following subsystem design:-

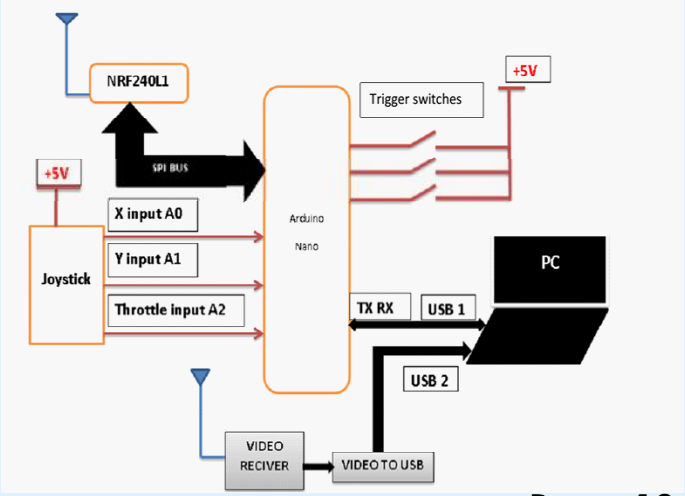
- Ground control station
- UAV control station
-

GROUND CONTROL STATION

As in the UAV flight controller the ground control station is designed around the Arduino Nano, joystick, throttle stick, ground station NRF , computer, USB adapter and video system link cable. The ground control system based on the Arduino nano will be used take inputs from the operator or pilot and transmit this control signals to the UAV flight controller for remote control, while at the same time receiving telemetry data from the UAV flight controller.

ARDUINO NANO BASED SUBSYSTEM DESIGN

The Arduino Nano is a less power full version of the Arduino mega microcontroller which will be used as the main interfacing microcontroller in the groundstation. The Arduino Nano will be used as a helper to the Arduino MEGE to manage the RF links between the ground station and the UAV.



UAV CONTROL STATION

ARDUINO MEGA BASED SUBSYSTEM DESIGN

The Arduino mega is a power full microcontroller based on the Atmel chip. The flight controller will be using Arduino mega as the main computing processor to control the UAV.

NRF240L1 TRANSCEIVER RADIO MODULE

The nRF24L01 is a single chip 2.4GHz transceiver with an embedded baseband protocol engine designed for ultra-low power wireless applications. The nRF24L01 works on worldwide ISM frequency band between 2.400 - 2.4835GHz. A microcontroller and very few external passive components are needed to design a radio system with the nRF24L01. The nRF24L01 is configured and operated through a Serial Peripheral Interface "SPI". Through this inter-face the register map is available. The register map contains all configuration registers in the nRF24L01 and is accessible in all operation modes of the chip. The radio front end uses GFSK modulation. It has user configurable parameters like frequency channel, output power and air data rate. The air data rate supported by the nRF24L01 is configurable between 250kps to 2Mbps. The high air data rate combined with two powers saving modes makes the nRF24L01 very suitable for ultra-low power designs. Internal voltage regulators ensure a high Power Supply Rejection Ratio (PSRR) and a wide power supply range.

IMU CHIP SENSORS

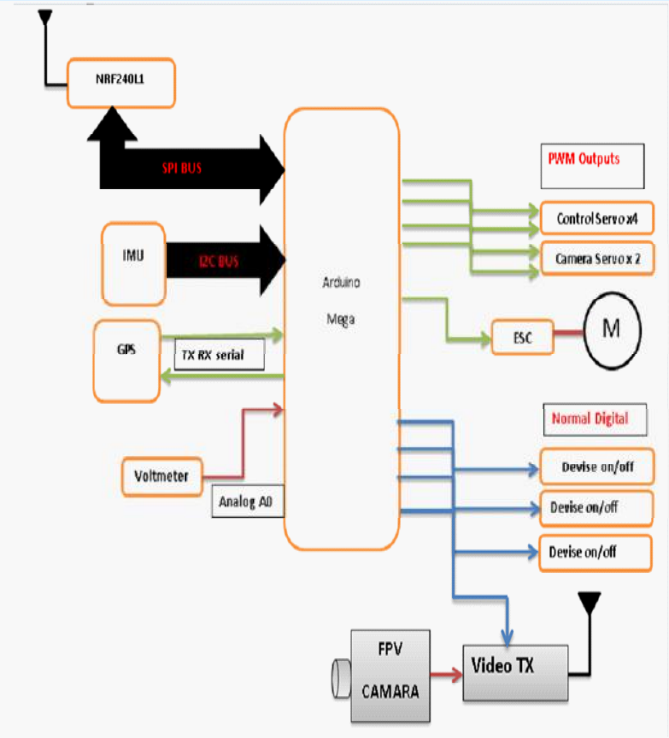
The MPU9250 + BMP180 are all in one 10 degree of freedom IMU chip. It includes a 3-axis gyroscope + 3-axis accelerometer + 3-axis magnetic field + barometric altitude sensor. All this sensors use built in BUS based on the I2C commination protocol. This chip will Be the main sensor in the flight controller providing flight telemetry to the operator on the ground.The fusion of the 3-axis gyroscope + 3-axis accelerometer data will provide the Orientation of the UAV during flight thus providing the operator 3D environmental awareness of the UAV. The 3-axis magnometer is used to calculate the heading of the UAV direction relative to North Pole. Finally the barometer is used to measure the atmospheric pressure and calculate the altitude of the UAV in flight.

MOTION OF THE UAV CONTROLLING SUBSYSTEM DESIGN

The 2axis joystick will be used as input to control the flight direction of the UAV by the operator .it will be used to control pitch yaw and bank movements of the UAV. This joystick moves the flight in x and y direction. all this are connected to the arduino nano.
The throttle stick will be used to control the power setting of the main power house motor, thus controlling the speed of the UAV in flight. that is either to speed up or down for the UAV flight.

DISPLAYING ON PC INTERFACE

The ground station main task will be to provide an interface between the ground control station components and the pc which is used to processes the data for GUI.
One of the basic features of our system is to capture video signals from the UAV a video recorder adapter to the USB 2 is going to visualize on the computer through a media player. The video system is composed of the FPV camera and video signal transmitter. The main function of the system will be to capture ground image and transmit it to the ground control station. This camera is very small in size that placed under the main part of the UAV in fraction of seconds what it capture is going to transmit to the ground station. Then the video system on the ground will receive and convert it into digitalize form through USB port to display on PC.



FUTURE ENHANCEMENT AND APPLICATION

The UAV with its silent operation can protect VIP's from assassination by performing aerial observation, buried object detection, facial recognition, and laser targeting of hostile personnel. The system uses less -than lethal force or remote CS/CN tear gas deployment, and is also invaluable for counter -sniper detection and neutralization. Generally for Aerial photography the Octocopter is generally more stable.

UAV are also used for military purposes, with their primary task being intelligence-gathering reconnaissance. An Unmanned Aerial Vehicle (UAV), also known as a drone, is usually not designed to contain a human pilot. Remotely controlled target drone aircraft were used to train gun crews. New UAV drones are capable of making deliveries, washing windows of tall buildings from the outside, putting out fires, spraying, searching and rescuing people and animals not only in nature, but also in buildings, where drones are becoming an important tool for police and other security agencies. In addition, drones are becoming so large and strong with so much lifting power, they are also now being used to lift people and save them from burning buildings or sinking boats

CONCLUSION

The design of UAV is very important and interesting project of the Computer Engineering field. In this project We learnt about the working, terminology, factors affecting to flight, construction, application and advantage of the UAV. We also studied about the designing of UAV. We check-out aeronautics formula rules and equation .We made the UAV by foam material in this semester. We were also studied about the errors out coming from the preparation of the model.

Quote Of The Month

ROCKET ENGINE

- EFREM GHIRMAY
- IBRAHIM YOSUF
- HENOK DANIEL
- YOHANNES T/MARIAM
- MICHAEL FITSUM

INTRODUCTION

Our project is mainly focused on military aircraft that are powered by jet engine. In military aircrafts the jet engine is equipped with extra thruster called the Afterburner mechanism, which produce extra thrust force when needed. But this extra force produced come at a cost of high fuel consumption.

Our idea is to replace this mechanism with Rocket Engine. This rocket engine produce more thrust force than the afterburner in short period of time. Also there is no altitude limitation for rocket engine to operate because it carries it's own oxidizer.

By replacing the afterburner mechanism with rocket engine we reduce the fuel consumption used to operate the afterburner mechanism and the thrust force produced by the rocket engine is considerably higher than that of the afterburner mechanism.

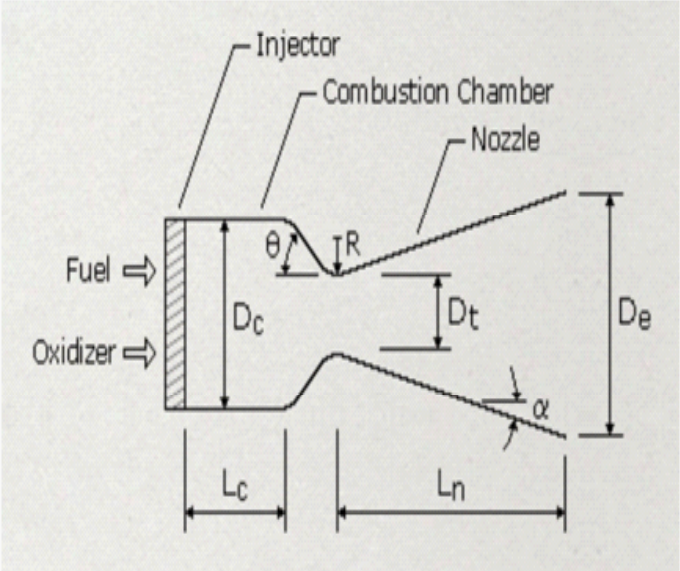
OBJECTIVE

The main objective of this project is to replace the thrust force produced by after burner or reheat mechanism in turbo jet powered military aircraft by rocket engine. Afterburner or reheat is a mechanism by which a high level of thrust force is produced by injecting a fuel directly in to the exhaust nozzle. This mechanism is engaged when a force beyond the capability of the turbo jet engine is required. This results in high fuel consumption that results reducing the flight time.

By replacing this mechanism with rocket engine reduces the fuel consumption and rocket engine produce high level of thrust in short period of time.

ROCKET ENGINE

A typical rocket engine consists of the nozzle, the combustion chamber, and the injector, as shown in Figure 3.2. The combustion chamber is where the burning of propellants takes place at high pressure. The chamber must be strong enough to contain the high pressure generated by, and the high temperature resulting from, the combustion process. Because of the high temperature and heat transfer, the chamber and nozzle are usually cooled. The chamber must also be of sufficient length to ensure complete combustion before the gases enter the nozzle.



Schematic Diagram of typical Rocket Engine

COMBUSTION CHAMBER

The thrust chamber is the key subassembly of a rocket engine. Here the liquid propellants are metered, injected, atomized, vaporized, mixed, and burned to form hot reaction gas products, which in turn are accelerated and ejected at high velocity. The combustion chamber serves as an envelope to retain the propellants for a sufficient period to ensure complete mixing and combustion. The combustion chamber is that part of a thrust chamber where the combustion or burning of the propellant takes place. The combustion temperature is much higher than the melting points of most chamber wall materials.

Therefore it is necessary either to cool these walls or to stop rocket operation before the critical wall areas become too hot. If the heat transfer is too high and thus the wall temperatures become locally too high, the thrust chamber will fail.

NOZZLE

The function of the nozzle is to convert the chemical-thermal energy generated in the combustion chamber into kinetic energy. The nozzle converts the slow moving, high pressure, high temperature gas in the combustion chamber into high velocity gas of lower pressure and temperature. Since thrust is the product of mass and velocity, a very high gas velocity is desirable. Nozzles consist of a convergent and divergent section. The minimum flow area between the convergent and divergent section is called the nozzle throat. The flow area at the end of the divergent section is called the nozzle exit area. The nozzle is usually made long enough (or the exit area is great enough) such that the pressure in the combustion chamber is reduced at the nozzle exit to the pressure existing outside the nozzle. It is under this condition, Pe=Pa where Pe is the pressure at the nozzle exit and Pa is the outside ambient pressure that thrust is maximum and the nozzle is said to be adapted, also called optimum or correct expansion. When Pe is greater than Pa, the nozzle is under-extended. When the opposite is true, it is over-extended.

INJECTOR

A great number of injectors have been developed and many details of successful injector designs are now available. However, there still are no hard-and-fast rules to assure a successful design. In the past, most injectors were designed by a trial-and-error approach, with the help of previous test data. While good results have eventually been obtained, it was usually at the expense of large amounts of time and money. A more rational approach toward the design of injectors is through understanding and prediction of the chemical and physical processes that are encountered within the combustion chamber, and using this information as a basis for initial injector design. For a given propellant combination, the chemical reactions and the kinetics of stream breakup, mixing, droplet formation, and heat transfer should be studied and clearly understood, before the approach to the design of an injector is established.

There are numerous requirements to qualify a given injector for operational use. The following are the most important objectives for injector design:

- Combustion stability
- Performance
- Structural integrity
- Hydraulic qualities
- Combustion chamber heat protection
- Special requirements

PROPELLANT TANK

Propellant is the chemical mixture burned to produce thrust in rockets and consists of a fuel and an oxidizer. A fuel is a substance that burns when combined with oxygen producing gas for propulsion. An oxidizer is an agent that releases oxygen for combination with a fuel. The ratio of oxidizer to fuel is called the mixture ratio. A good liquid propellant is one with a high specific impulse or, stated another way, one with a high speed of exhaust gas ejection. This implies a high combustion temperature and exhaust gases with small molecular weights.

However, there is another important factor that must be taken into consideration: the density of the propellant. Using low-density propellants means that larger storage tanks will be required, thus increasing the mass of the launch vehicle.
Propellant Tanks propellant tank design configuration of a typical Rocket propulsion system. Here, the tank are contained within an outer cylindrical shell, through which thrust is transmitted to the payload.
The shell is designed to withstand all anticipated boost and flight loads. The propellant tankage consists of two individual units. The two welded aluminum- alloy tanks are modified spheres, faired into conical sections at the bottom for propellant discharge. The tanks are bolted to the shell structure around their support ring.

COOLING SYSTEM

The heat created during combustion in a rocket engine is contained within the exhaust gases. Most of this heat is expelled along with the gas that contains it; however, heat is transferred to the thrust chamber walls in quantities sufficient to require attention.
Thrust chamber designs are generally categorized or identified by the hot gas wall cooling method or the configuration of the coolant passages, where the coolant pressure inside may be as high as 500 atmospheres. The high combustion temperatures (2,500 to 3,600o K) and the high heat transfer rates (up to 16 kJ/cm2-s) encountered in a combustion chamber present a formidable challenge to the designer. To meet this challenge, several chamber-cooling techniques have been utilized successfully. Selection of the optimum cooling method for a thrust chamber depends on many considerations, such as type of propellant, chamber pressure, available coolant pressure, combustion chamber configuration, and combustion chamber material.
The types of cooling systems that we choose in our rocket jet are:-
A. Gas-Side Heat Transfer (Convective Heat Transfer).
B. REGENERATIVE COOLING.
C. FILM COOLING (Liquid Film Cooling).
D. RADIATION COOLING.

Regenerative cooling is the most widely used method of cooling a thrust chamber and is accomplished by flowing high-velocity coolant over the back side of the chamber hot gas wall to convectively cool the hot gas liner. The coolant with the heat input from cooling the liner is then discharged into the injector and utilized as a propellant.
Film cooling provides protection from excessive heat by introducing a thin film of coolant or propellant through orifices around the injector periphery or through manifolded orifices in the chamber wall near the injector or chamber throat region. This method is typically used in high heat flux regions and in combination with regenerative cooling.
Radiation cooling, heat is radiated from the outer surface of the combustion chamber or nozzle extension wall. Radiation cooling is typically used for small thrust chambers with a high- temperature wall material (refractory) and in low-heat flux regions, such as a nozzle extension.

CHALLENGES ENCOUNTERED DATA COLLECTION

Since we were gathering information about military rockets and fuels most of the data that we acquire are as old as 30 -40 years old.

FEED SYSTEM AND CONTROL SYSTEM

At first we choose to use pressure-fed system for the Rocket engine. B/c pressure-fed system is independent of the main engine of the aircraft but pressure-fed system can't be used for high level of thrust. To achieve high level of thrust high amount of pressurization gas is needed this means large weight of pressurization gas is required. But increasingweight of fuel means decreasing in payload. To over come this challenge turbo-fed system is preferred. But this system is integrated with the main engine of the aircraft. The exhaust gases of the main engine drive the turbine used to run the pumps. This system is complicated and sophisticated. Control system is mostly field of electrical and computer engineering. At first we think of some existing control system for our engine but the existing systems are for rocket propulsion only and most are classified since they are designated for military purpose and we can't use aircrafts control system.So for these reasons we didn't design fuel feed system and control system and mainly since we are talking about modifying existing aircrafts we decide that it is better to leave these two parts to the manufacturers standard.

FUTURE ENHANCEMENT

Up until now rocket engine and jet engine haven't been used integrated. However there are some aircrafts that use rocket engine as a booster to assist them at take off. But immediately after take off the rocket engine is dropped. This is used in aircrafts that take off from carrier ships, or is used when heavy load is encountered; in these cases to reduce fuel consumption of the jet engine rocket boosters are used. Our work leads to integrated the rocket engine in the aircraft to operate simultaneously as one to reach the desired goal of the project.

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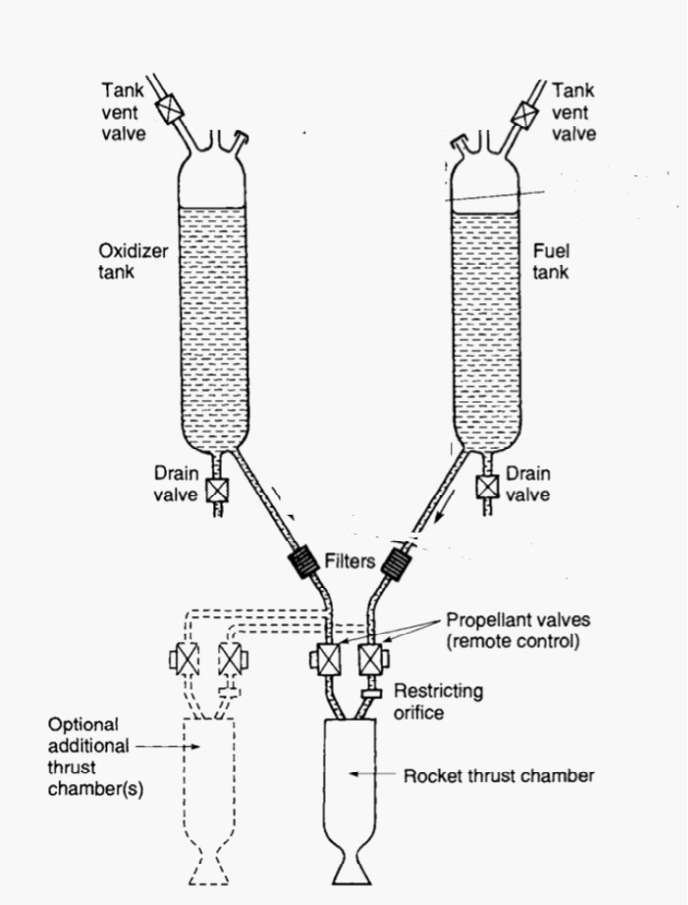


Mentor Questions Tricky

1. There is a man who lives on the top floor of a very tall building. Everyday he gets the elevator down to the ground floor to leave the building to go to work. Upon returning from work though, he can only travel half way up in the lift and has to walk the rest of the way unless it's raining! Why? (This is probably the best known and most celebrated of all lateral thinking puzzles. It is a true classic. Although there are many possible solutions which fit the initial conditions, only the canonical answer is truly satisfying.)

2. A man and his son are in a car accident. The father dies on the scene, but the child is rushed to the hospital. When he arrives the surgeon says, "I can't operate on this boy, he is my son! " How can this be true?

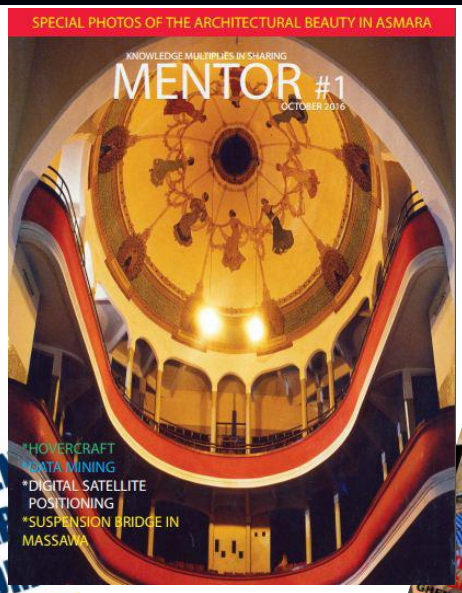
3. A man is wearing black. Black shoes, socks, trousers, lumper, gloves and-balaclava. He is walking down a black street with all the street lamps off. A black car is coming towards him with its light off but somehow manages to stop in time. How did the driver see the man?

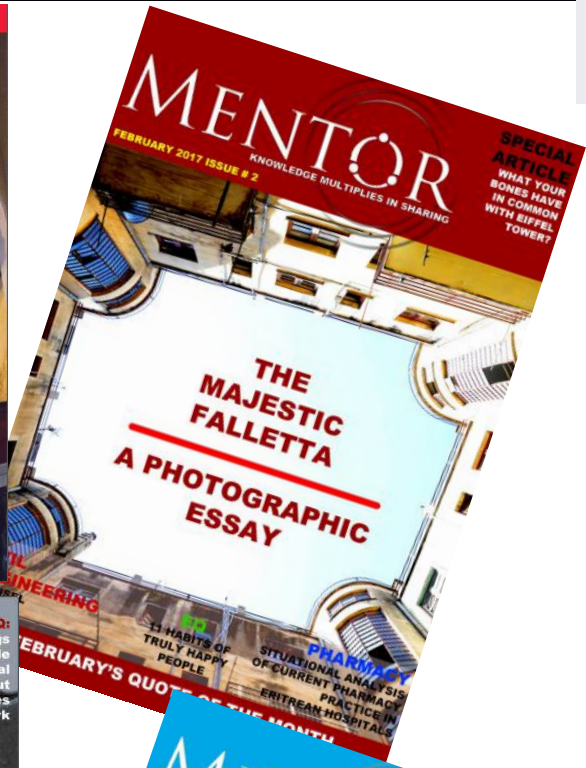
4. Why is it better to have round manhole covers than square ones? This is logical rather than lateral, but it is a good puzzle that can be solved by lateral thinking techniques. It is supposedly used by a very well-known software company as an interview question for prospective employees.

5. A man went to a party and drank some of the punch. He then left early. Everyone else at the party who drank the punch subsequently died of poisoning. Why did the man not die?

6. A man walks into a bar and asks the barman for a glass of water. The barman pulls out a gun and points it at the man. The man says 'Thank you' and walks out. (This puzzle claims to be the best of the genre. It is simple in its statement, absolutely baffling and yet with a completely satisfying solution. Most people struggle very hard to solve this one yet they like the answer when they hear it or have the satisfaction of figuring it out.)

Image Of The Month





PHOTOGRAPHIC ESSAY: RELIGIOUS CEREMONY

Religious dancing and singing on Holy Cross day.


MUSSIE


MUSSIE


The sun was setting down but the beauty
of our city got more Coruscating

EQ: 10 Habits That Will Make You Much Happier

Human Behaviour in Numbers

In the following series, Dr. Travis Bradberry's captivating lessons on Emotional Intelligence wil be covered. Dr. Travis Bradberry is an award-winning co-author of Emotional Inteligence 2.0 and the co-founder of TalentSmart® the world's leading provider of emotional intelligence tests and training serving more than 75% of Fortune 500 companies. His bestselling books have been translated into 25 languages and are available in more than 150 countries.

Happiness comes in so many different forms that it can be hard to grasp. Unhappiness, on the other hand, is easy to identify; you know it when you see it, and you definitely know when it's taken ahold of you.

And let's face it, happiness and work do not always go hand in hand. A 2013 Gallup study, which reported data from more than 180 million people, found that just 13% of us consider ourselves to be "happily engaged at work."

Those who do rate themselves as happy are 36% more motivated, six times more energized, and twice as productive as their unhappy counterparts.

Happiness actually has less to do with your circumstances than you might think. A University of Illinois study found that people who earn the most (more than $10 million annually) are only a smidge happier than the average Joes and Janes who work for them, and psychologists from the University of California found that genetics and life circumstances only account for about 50% of a person's happiness. The rest is up to you.

Life circumstances have little to do with happiness because much happiness is under your control—the product of your habits and your outlook on life. Happiness is synthetic—you either create it, or you don't.

When it comes to making yourself happy, you need to learn what works for you. Once you discover this, everything else tends to fall into place. And making yourself happydoesn't just improve your performance; it's also good for your health.

A critical skill set that happy people tend to have in common is emotional intelligence (EQ). At TalentSmart, we've tested the EQs of more than a million people and know what makes high EQ people tick. So, we went digging until we found some great ways that emotionally intelligent people create their own happiness.

1. They don't obsess over things they can't control. It's good to know how the Brexit might affect your country's markets or that your company could merge with its largest competitor, but there's a big difference between understanding these larger forces and worrying about them. Happy people are ready and informed, but they don't allow themselves to fret over things that are beyond their control.

2. They choose their battles wisely. Emotionally intelligent people know how important it is to live to fight another day. In conflict, unchecked emotion makes you dig your heels in and fight the kind of battle that can leave you severely damaged and unhappy for some time to come. When you read and respond to your emotions, you're able to choose your battles wisely and only stand your ground when the time is right.

3. They get enough sleep. I've beaten this one to death over the years and can't say enough about the importance of sleep to improving your mood, focus, and self-control. When you sleep, your brain literally recharges, removing toxic proteins that accumulate during the day as byproducts of normal neuronal activity. This ensures that you wake up alert and clear-headed. Your energy, attention, and memory are all reduced when you don't get enough quality sleep. Sleep deprivation also raises stress hormone levels on its own, even without a stressor present. Happy people make sleep a priority, because it makes them feel great and they know how lousy they feel when they're sleep deprived.

4. They heed their moral compass. Crossing moral boundaries in the name of success is a sure-fire path to unhappiness. Violating your personal standards creates feelings of regret, dissatisfaction, and demotivation. Know when to stand your ground and express dissent when someone wants you to do something that you know you shouldn't. When you're feeling confused, take some time to review your values and write them down. This will help you to locate your moral compass.

5. They exercise during the week. Getting your body moving for as little as 10 minutes releases GABA, a soothing neurotransmitter that also limits impulsivity. A University of Bristol study showed that people who exercised on workdays reported improvements in time management, mood, and performance. The benefits of exercise always outweigh the time lost in its pursuit.

6. They have a growth mindset. People's core attitudes fall into one of two categories: a fixed mindset or a growth mindset. With a fixed mindset, you believe you are who you are and you cannot change. This creates problems when you're challenged, because anything that appears to be more than you can handle is bound to make you feel hopeless and overwhelmed. People with a growth mindset believe that they can improve with effort. This makes them happier because they are better at handling difficulties. They also outperform those with a fixed mindset because they embrace challenges, treating them as opportunities to learn something new.

7. They clear the clutter. I don't need to remind you of how much time you spend at work. Take a good look at your workspace. You should create a space that's soothing and uplifting. Whether it's a picture of your family, a plant, or an award that you're proud of, display them prominently to keep them on your mind. Get rid of the junk and clutter that hold no significance and do nothing positive for your mental state.

8. They lend a hand. Taking the time to help your colleagues not only makes them happy, but it also makes you happy.

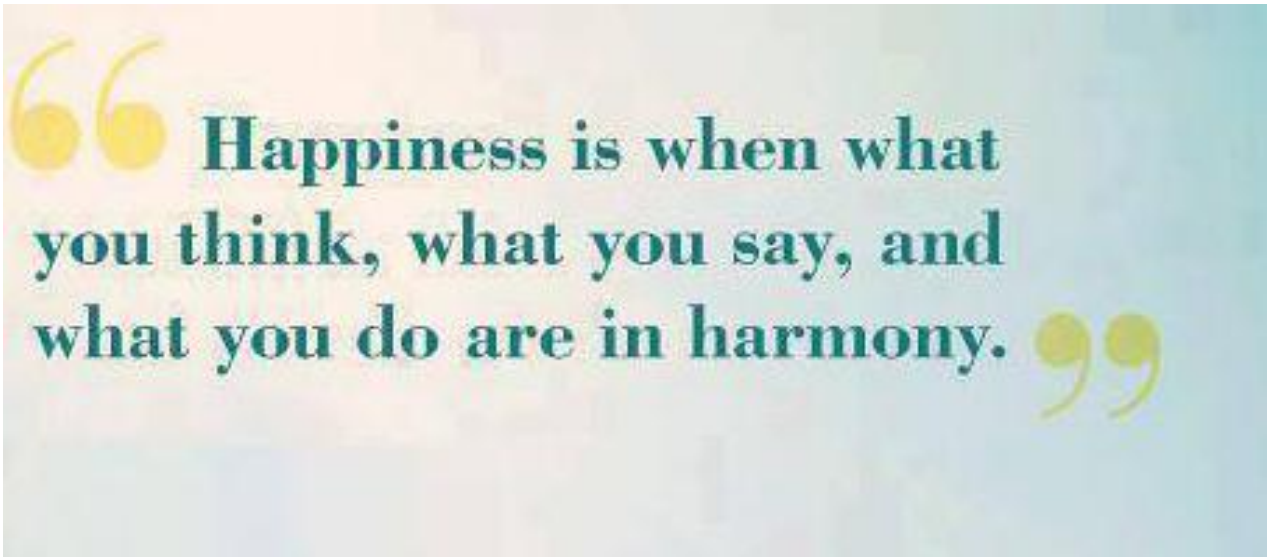
Helping other people gives you a surge of oxytocin, serotonin, and dopamine, all of which create good feelings. In a Harvard study, employees who helped others were 10 times more likely to be focused at work and 40% more likely to get a promotion. The same study showed that people who consistently provided social support were the most likely to be happy during times of high stress. As long as you make certain that you aren't overcommitting yourself, helping others is sure to have a positive influence on your happiness.

9. They let their strengths flow. A University of Chicago study of peak performance found that people who were able to reach an intense state of focus, called flow, reaped massive benefits. Flow is the state of mind in which you find yourself completely engrossed in a project or task, and you lose awareness of the passage of time and other external distractions. Flow is often described as an exhilarating state in which you feel euphoria and mastery simultaneously. The result is not just happiness and productivity but also the development of new skills through a heightened state of learning. The key to reaching flow lies in organizing your tasks such that you have immediate and clear goals to pursue that play to your strengths. As you begin working on these tasks, your focus increases along with your feelings of adequacy. In time, you reach a flow state, in which productivity and happiness flourish. Set clear goals each day and experiment with task order until you find the secret formula that gets you flowing.

10. They believe the best is yet to come. Don't just tell yourself that the best is yet to come—believe it. Having a positive, optimistic outlook on the future doesn't just make you happier; it also improves your performance by increasing your sense of self-efficacy. The mind has a tendency to magnify past pleasure to such a great degree that the present pales in comparison. This phenomenon can make you lose faith in the power of the future to outdo what you've already experienced. Don't be fooled. Believe in the great things the future has in store.

Bringing It All Together

Applying these strategies won't just improve your happiness at work; most of them will also improve your emotional intelligence. Pick those that resonate with you and have fun with them.



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