

# VR and AR Based Training Aid

## Background:

Naval Institute of Aeronautical Technology (NIAT) is a leading Government College based in Kochi controlled by the Indian Navy. The institute offers a wide array of academic courses and programs that are approved by AICTE. The college, affiliated with Cochin University of Science & Technology, Kochi, is widely recognized for its academic standards.

## Solutions:

For Garrett TPE we developed a Unity application so that with a minimum code change we can use the same source code to build a VR-based application for HTC VIVE and a Desktop based application for Windows. The 3D model of Garrett TPE was created based on the text, images and videos, and other available information from the OEM (Original equipment manufacturer) site and open sources. Workflow explanation of the engine is done through various animations for air intake, fuel flow, exhaust, etc.

For DC Generator we suggested a Unity-based AR application that can run on their requested Android tablet. The 3D model of the DC Generator is prepared by referring to the actual hardware they have provided. We have used the Vuuforia library in the Unity application for the detection of real hardware and plane recognition.

Using the developed applications, the trainees can see very minute details of every part of this equipment and if they want to see more details about a part, there is an option to dismantle and take out that part with a single tap. Whenever a student interacts with the application there will be a voice assistant with a detailed explanation about the part for their assistance. We also provided the dismantling of each part with its audio and textual explanation. Also, there is an option to render textual descriptions and audio files for a detailed explanation about the subsystems upon selection. All the assets like 3D model, text, and audio files are embedded right into the application, so that they can work com-

## Problem Statement:

NIAT has come up with an issue of how to give opportunities for their trainees for self-learning and distance learning. To make this process easy, NIAT focused on providing a distributed training mechanism with the help of AR and VR technologies which could assist in the self-study of engine parts, aircraft, and all other equipment without any instructor. With the help of an AR or VR application, the trainees can see the equipment in an AR/VR platform and can achieve effective learning. They were checking for an AR-based solution for DC generator and VR & PC based solutions for Garrett TPE. As part of the training aid, interactive 3D graphical representation of Garrett TPE and DC Generator has to be made, and also their theoretical explanations, dismantling, and understanding of its various sections should be done along with audio, textual, and graphical contents. They needed all the audio explanations in an Indian accent, to give a better understanding of it to the trainees along with the subtitles. They also mentioned that all these applications should work offline without any issues.

## AR-based DC Generator

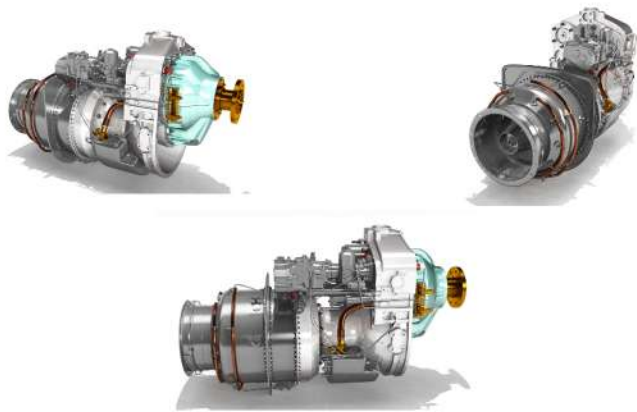
AR-based DC generator was developed in two ways. If the original model is not available the candidate can scan a flat surface and can place that 3D Model there or the candidate can scan the real hardware and place the developed 3D Model over it in an AR Environment. The parts of the DC Generator can be dismantled and the candidate can understand the various parts by hearing the audio and textual information about each part without the help of an instructor.



3D Model of DC Generator

## Garrett TPE Application

A Garrett TPE 3D model was made with airflow animations and fluid flow animations. It was a completely offline immersive VR application rendered on a VR Headgear to aid the Garrett TPE training. We have also developed a flexible software application i.e., it is both immersive (rendered on a VR Headgear) and non-immersive (rendered on a system powered by windows OS with monitor) for smooth conduct of training of individual or group of trainees. The trainees can dismantle and understand the various part by zooming and rotating the parts. There was also a provision to turn on and off the audio, hiding the subtitle and skipping to the next step in the work flow.



3DModel of Garrett

## Challenges

### DC Generator AR application

- Detection of real hardware in the proposed Android tablet

### Garrett TPE Application

- Integrating and setting up the VR Application with HTC VIVE.
- Creation of the Garrett TPE 3D model from the images that are available online.
- Demonstrating the engine workflow using different particle and engine cross-section.
- Fuel flow Demonstration
- Providing the X-ray view of the engine



## Benefits

- Real model and its cross-section were not possible to show every time for trainers where our application plays a big role with distance learning through VR.
- This application provides very minute details of every part of the engine, and if they wanted to see more details about a part, there is an option to dismantle and take out that part with a single tap. Whenever a student sees something there will be a voice assistant with a detailed explanation about the part for their assistance.
- We are not physically handling it so there won't be any damage.
- No need for instructors every time the student can understand it easily.
- The Application provided the trainee a self-learning tool for enhancement of his/her technology and has given a vivid understanding of the concepts.

## Tech Stacks

AUTODESK  
MAYA

unity

htc VIVE

vuforia