Aircraft Training and Simulation Utilizing the Quantum Optics Holophoto™ Three-Dimensional Process

Pilots begin their training in flight simulators long before they actually fly planes. Flight simulators allow a pilot to run through a large number of scenarios, beginning with take-off and landing. Once successful, they are presented with programs that simulate various disasters that they must avoid.

Examples of Commercially Available Flight Simulators

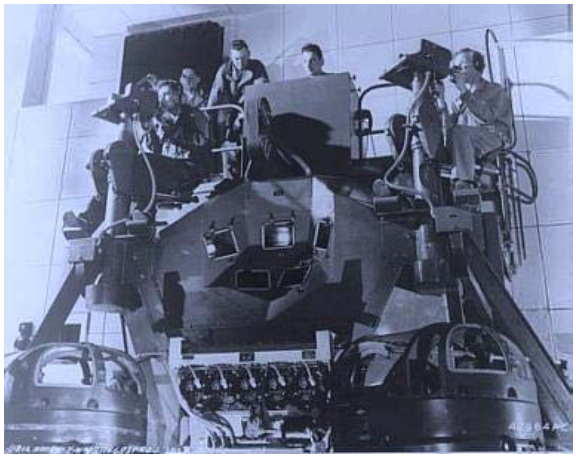
It can be seen from the above photographs that a computer screen presents the pilot trainee with various flight scenarios. Below the computer screen is a cockpit control panel that simulates instrument readings that change based upon his actions. The simulated aircraft is controlled using a hand manipulated yoke and foot brakes. Controls for flaps and landing gear are also provided. The simulation software activates hydraulic controls for the seat so that the trainee can feel the motion of the simulated aircraft. This simulator is affordable for amateur pilots. However, it uses a flat panel computer screen, which cannot provide a realistic environment necessary to train military flight personnel.

In addition, very inexpensive flight simulation software is available for personal computers. In effect, these are more characteristic of games than of flight training. An example of this type of computer package is Microsoft® Flight Simulator. Military flight simulators must be more complex.

Flight Simulator For Military Applications

The above photograph shows a typical flight simulator used to train pilots to fly military jet airplanes. Comparing the photograph shown above to the photographs of the commercially available flight simulators, one can see that the

simulation screen partially surrounds the pilot trainee to create an environment more like that which would be experienced in an actual aircraft. Here, a trainee sits in a hydraulically controlled seat with all of the aircraft controls at his fingertips. The difference here is that the pilot is presented with scenarios that encompass his peripheral vision.



Front View of VITARAMA Simulator

The VITARAMA Gunnery Training Simulator

The concept of simulators that encompass a trainee's peripheral vision is not new. The VITARAMA simulator (shown above), invented by Fred Waller, was used during World War II to train aircraft gunners to fight Nazi aircraft. The top two pictures are army photographs of the rear view of a VITARAMA simulator. The top right photograph shows the fighting scenario that might be

observed by a gunner. Note the enemy plane in the picture. The bottom right photograph is a front view of the simulator, and the bottom left photograph shows a gunner trainee seated in the device. Thousands of gunners in the United States and Great Britain were prepared for actual combat using this training device. It is credited with saving hundreds of lives. During the late 1940's, the details of this training device were declassified. Fred Waller then used his invention to create the extremely popular CINERAMA motion picture process.

During World War II, gunners were stationed in the rear and on the sides of large bomber aircraft. No surround-screen simulators were used to train pilots during World War II. In modern times, gunners are no longer used. Pilots control weapons themselves. Today, this surround-screen concept is used to train pilots for all types of aircraft. Not only are surround-screen simulators necessary to train pilots of fixed wing aircraft, they are even more useful in training helicopter pilots. They are even used to train space shuttle pilots.

Large fixed-wing airplanes have a limited field of view. Pilots on this type of aircraft see what is in front of and alongside of them with a partial view from below. Jet fighter pilots have a greater visual field. They can also look to see what is above. Helicopter pilots have the greatest field of view in that they can see what is below the aircraft. Surround-screen flight simulators are necessary to provide realistic scenarios to train pilots.

Although the peripheral vision provided by the surround-screen displays adds realism to the training experience, they are only two-dimensional. The experience is not quite real. Three-dimensional scenarios can be added to current flight simulators using state-of-the-art 3-D stereoscopic technology. A pilot trainee can wear polarized goggles that would enable him to observe the scene in three-dimensions. However, stereoscopic 3-D does not emulate reality. It does not permit selective focusing on multiple objects (such as enemy aircraft or missiles) in a scene. When a person normally views a scene, in which some objects are closer than others, his eyes focus on a selected object while the other objects are blurry. Stereoscopic 3-D cannot emulate this condition.

Furthermore, an inherent property of stereoscopic 3-D is that it causes eyestrain and headaches. If a pilot spends too many hours in a flight simulator looking at a stereoscopic 3-D display, it will cause additional stress. Furthermore, the pilot will not get the benefit of a real simulation.

A Quantum Optics Holophoto™ three-dimensional flight simulator would not only provide peripheral vision, but it would also provide a completely real visual experience. A pilot trained on this flight simulator would not require any special goggles. There would be neither eyestrain nor headaches. With stereoscopic 3-D, a viewer sees two different images with his two eyes, and his brain tells him that he is looking at a three-dimensional scene. On the other hand, with the Quantum Optics Holophoto™ three-dimensional flight simulator, the light that would reach the trainee's eyes would be the same as if he was actually in the scene. He could perform no visual test that would tell him otherwise. The experience of flying an aircraft in a Quantum Optics Holophoto™ three-dimensional flight simulator would be the same as flying an actual military plane.

In addition, actual military aircraft could be equipped with a display that would permit pilots to see what is below the plane in three-dimensions and in real time. Such airplanes would be able to fire weapons vertically below the plane accurately. A heads-up real time three-dimensional display could also be provided to show what is behind the airplane. This would be similar to a large rear view mirror. With this type of display, a pilot could fire his rear weapons accurately. The Quantum Optics Holophoto™ three-dimensional flight simulator would allow pilot trainees to learn to fly airplanes having these new displays.