MITRE addressed Virtual Reality technology in the late 80's, with the development of headsets for pilots. In those days, the capabilities of VR technology were very limited, with the user appliances being head sets (focused on providing pilots, a platform for 3D synthetic displays) and data gloves (which provided xyz presentations of the hand and digits in real time).

MITRE worked on defining how VR could improve the user experience in contemporary applications and other areas where no solutions to the stated problems were then available. The resultant VR developments employed VR technology to sense the user and provide a 3D display .The emerging visualization technology which addressed the geospatial physical data bases (land masses) were a necessary complement to the resultant product. . The developing high end workstation technologies provided sufficient computing power to support the real time VR images.

In all cases, the desired VR performance required effective integration with the five human senses and provide a suitable response time for user actions with an illustration of a high fidelity display of the synthetic 3D display product. MITRE developed software tools allowed for rapid prototyping of the desired capabilities.

With commercial VR devices and MITRE developed software, the following representative projects were developed for VR applications :

1.The development of the real time 3D synthetic displays illustrating scenes of the ground for the user.

2. The development of a full size interactive virtual replica of a 20' control panel which operators used to operate a fossil fueled Boston Edison power plant in Everett, MA (the virtual control panel interacted with a real time model of the power plant's turbine to simulate operations of that plant). The virtue of this system was that it could be used for the many plants in the Edison System . This system provided for generating operational scenarios and recording the responses of the operating crew to many conditions some of which had not been employed in prior training sessions. The system addressed the problem that about once a month, an operator error resulted in smoke blossoming from the chimney with a result $250,000 fine from the EPA for each infraction. Reductions in these errors could provide return of investment in 2 + years.

3. The development of a full scale 3D replica of a virtual Maintenance trainer for the Hubble astronaut maintenance crew. This system facilitated training of maintenance operations in zero gravity (the issue was to simulate operations in zero gravity , the astronaut trained while submerged in a swimming pool), The

virtual maintenance trainer and the virtual environment in which the maintenance trainer was placed allowed the astronaut maintenance crew to practice the procedures before immersion in the pool, thus saving time for the training and minimizing risk to the astronaut.

4. The development of a 3D virtual visualization handset which allowed military logistics personnel to visualize the size and locations of the various assemblies required for a center which was to be airlifted to a remote operations site. The virtual handset allowed the operator to visualize the physical location of the subassemblies for that center in the warehouse , create the shipping orders for the required assemblies and keep a running tabulation of the assemblies in transit .

5.The development of the virtual operation room which allowed surgeons to perform remote surgical procedures on wounded military personnel located at a field hospital .This system used communications to couple the surgeon to surgical robots at the field site. Virtual surgery tools as well as the virtual surgery room environment were developed for this project. This project addressed the issue that most battlefield wounds were to the lower abdomen which required immediate surgery .

6. Conceived a virtual control center for air traffic controllers at a civil airport control center which could provide for continued operations in bad weather. This capability provided for integrating information from existing sensors and created a virtual 3D space with an air surveillance picture within the center's volume of responsibility . This system enabled the controllers to visualize aircraft location in the airspace when weather conditions precluded that with normal vision. This system has been put into further development in the Canadian Air Traffic Control system.

7. Developed the ability to create a 3D synthetic model of a building or location within relative real time from pictures or video of that location.

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