

Virtual (Augmented) Reality in simulators and actual flight



- Virtual Reality
 - Benefits
 - Limitations
- Virtual Augmented Reality
 - Benefits
 - Limitations
- Virtual (augmented) Reality in simulators
 - Training possibilities within regular FCL training
- Virtual augmented Reality actual flight
 - Training possibilities within regular FCL training
- Simulator challenges
 - Person machine interface Virtual Reality
 - Test requirements
- Real flight challenges
 - Virtual- vs Virtual augmented- reality
 - Test requirements
- Summary
- Questions



VR creates a computer generated reality.

Benefits

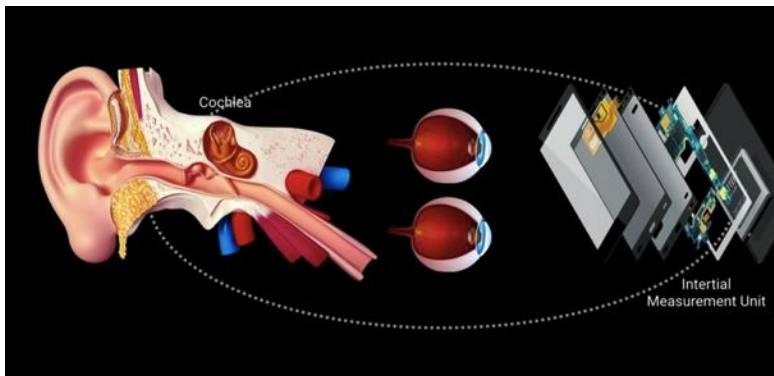
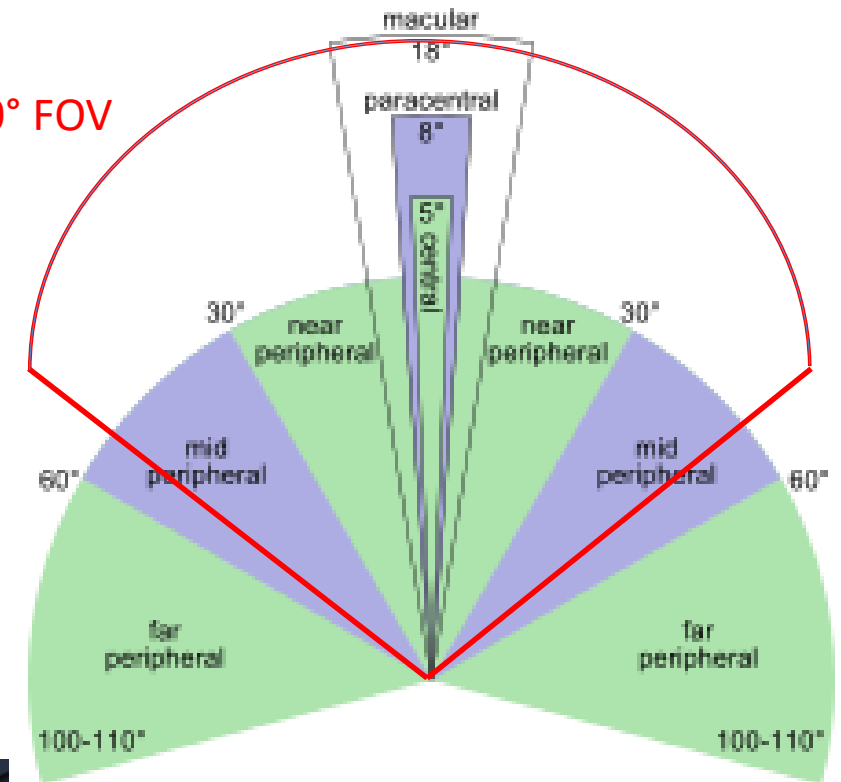
- Full control of the environment
- Full Field of regard
- Replica of the specific cockpit
- Always at the design eye point of the pilot
- 3D effects



Limitations

- Motion sickness
 - Refresh rate
 - Resolution
 - Animation
 - latency
- Person machine interface
 - Interaction with real object to simulated objects
 - Tactical feeling
- Far Peripheral vision
 - Currently on the market up to 100 degrees

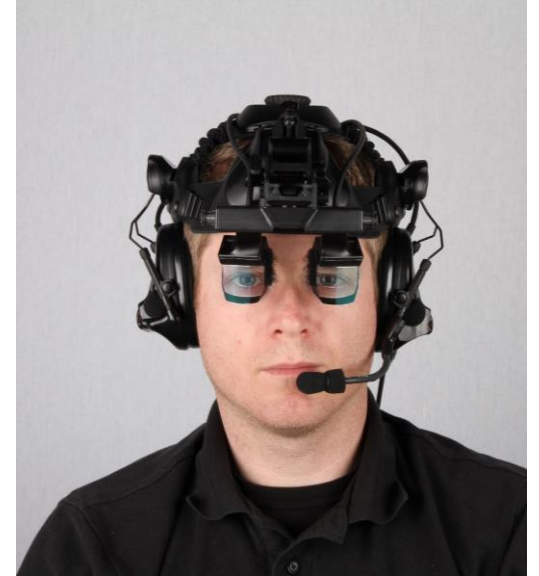
VR 100° FOV



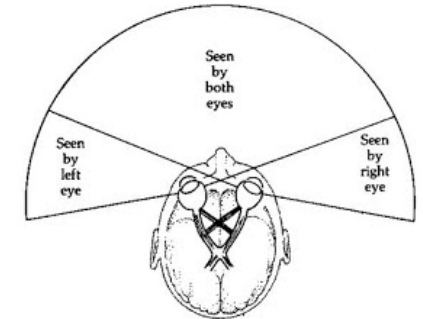
AR concept enhances user experience by adding virtual components such as digital images, graphics, or sensations etc providing a new layer of interaction with the real world.

Benefits

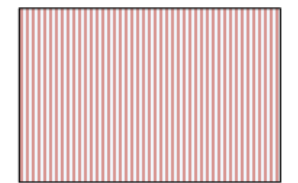
- Integrating real world with simulated world
- Person machine interface more intuitive



- Technical complicated
 - Requires head tracking and position tracking
- Geo spatial orientation
 - Objects related to eye point or geo point
- Person machine interface with AR images
- Near field and far field (depending system used)
- FOV eye overlap



Left

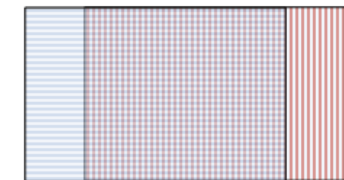


Right



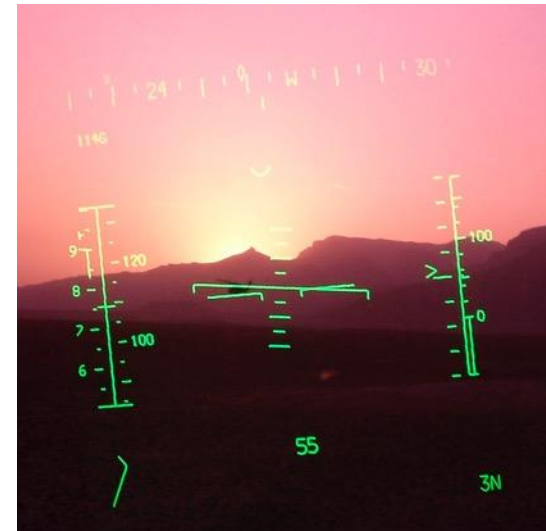
Left

Right



Left

Right



Training possibilities within regular FCL training (helicopter focus)

Virtual reality

- FTD 1/2/3 (Person machine interface required)
 - Conform NPA 2017-1 matrix
 - Non motion!

Virtual augmented reality

- FTD 1/2/3 & FFS
 - Conform NPA 2017-1 matrix

Cockpit VR



Cockpit VAR



Training possibilities within regular FCL training

Virtual Reality

- Not recommended

Virtual Augmented Reality

- CPL(H) visual training
- CPL(H) Basic Instrument training
- Operator Recurrent Training
- SPO training



- Commanders course
- Hoist training
- Confined area training
- Reduced visual environment training
- Route/Area/Aerodrome Knowledge

Person machine interface Virtual Reality

- How to incorporate own actions
- Create tactile feeling of action



Test requirements

Person machine interface QTG for VR

- Accuracy of person in the VR
- Latency of the movement

Person machine interface QTG for VAR

- Latency of movement
- Visual depth perception



Virtual- vs Virtual augmented- reality

- VR can not be used during real flight or motion based simulators
- VR is flexible
- VAR can be used during real flight or motion based simulators
- VAR complex in integration



Test requirements

For Virtual Augmented Reality, test requirements during real flight is not covered by the CS-FSTD.

- NPA 2017-1: Flight instruction, Dual or SPIC!



Virtual Reality

- Flexible, but limited to FTD only
- Virtual Reality Person machine interface importance
- COTS systems not yet easy to implement.

Virtual Augmented Reality

- may be used in FFS and actual flight
- Complex integration due to overlap real/simulated world
- A hybrid system between actual and simulator flight!



