



FORUM **AEROSPACE** INNOVATION

➤ APRIL 25 AND 26, 2016

**COLLABORATE
GLOBALLY
TO DEVELOP
AEROSPACE
INNOVATION**



IN COLLABORATION WITH:



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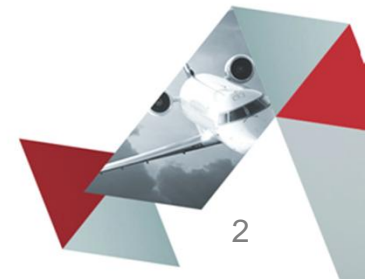


Québec's Aerospace Cluster

Immersive Displays for Virtual 3D Models

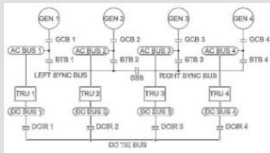
Andrew Fernie, CAE Inc.

April 26, 2016

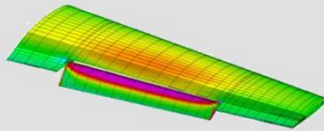


It Starts With Virtual Models

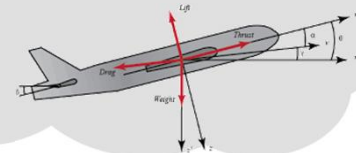
Systems Models



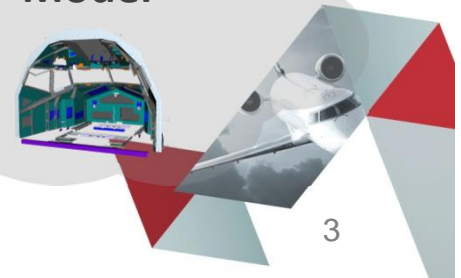
Analytical Models



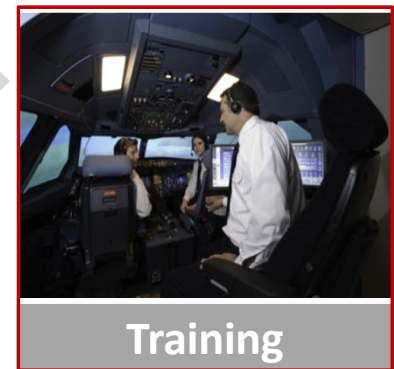
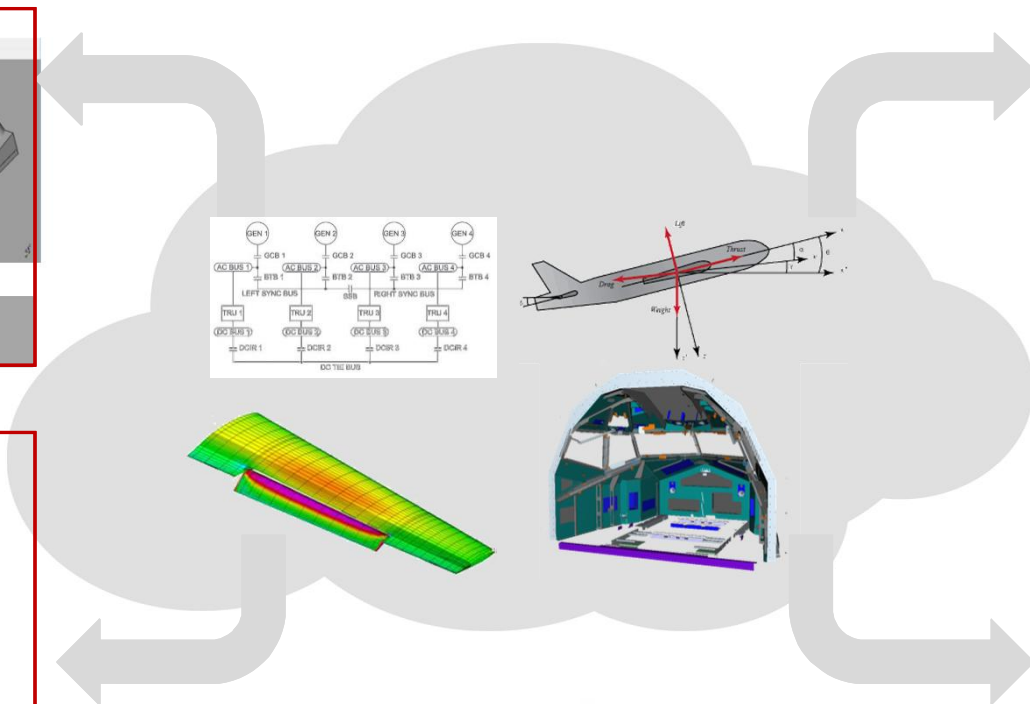
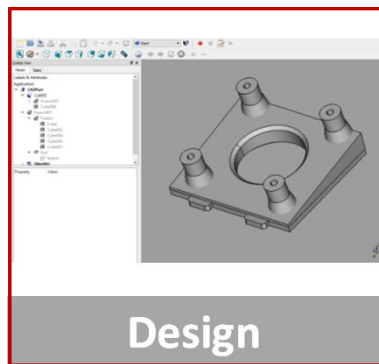
Performance Model



Mechanical Model



Models Support Multiple Interests



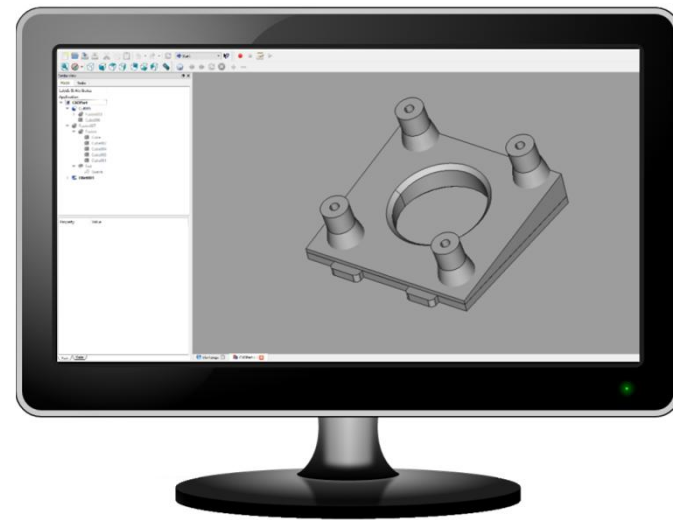
Visualizing the virtual model

- Visualizing a virtual model is the first step in making it real
- Many ways of visualizing the model depending on the application
- Each with its own advantages and disadvantages



Basic Monitor

- Models start from CAD or 3D modelling applications
- Applications optimized for design
 - Enter model
 - Modify model
- 3D parts displayed on a (2D) monitor
- Familiar interface that works well for this application



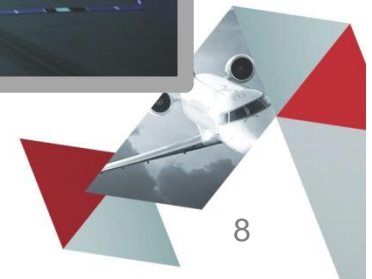
Immersive Displays

- Immersive displays bring the models and the viewer together in a virtual world
- Provides the designer with new perspectives...
 - of how parts will work together
 - of how the end user will see the final product
- Visualize complex models
- Visualize aesthetic elements
- Visualize models in a range of environments



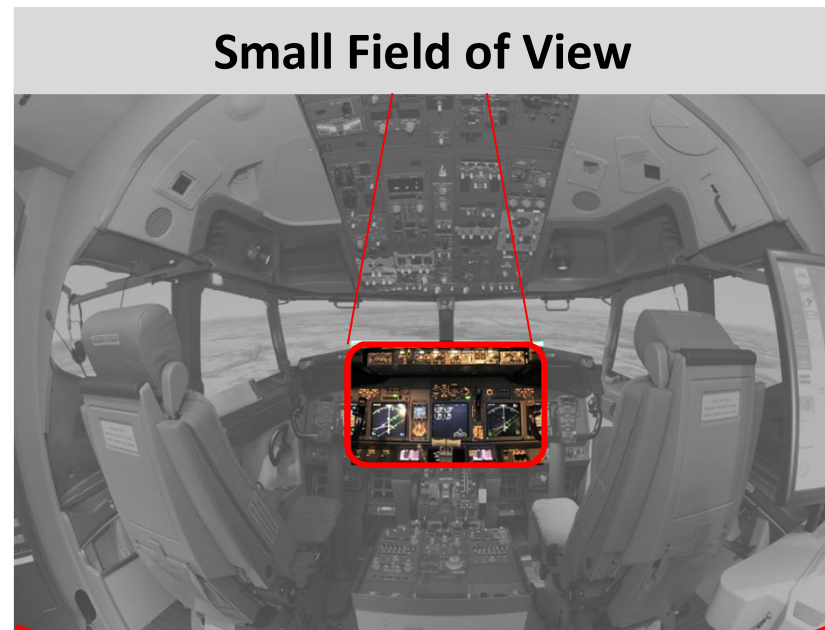
Some choices

- Immersive displays can support
 - Full or partial immersion
 - Restricted or unlimited fields of view
 - Exclude the physical world or add to it
 - One or multiple viewers



Display Parameters

- Range of performance parameters
 - Fields of view – how much can be seen at a time
 - Fields of regard – how much can be seen once head movement is taken into account
 - Resolution
 - Color, brightness



Large Field of Regard

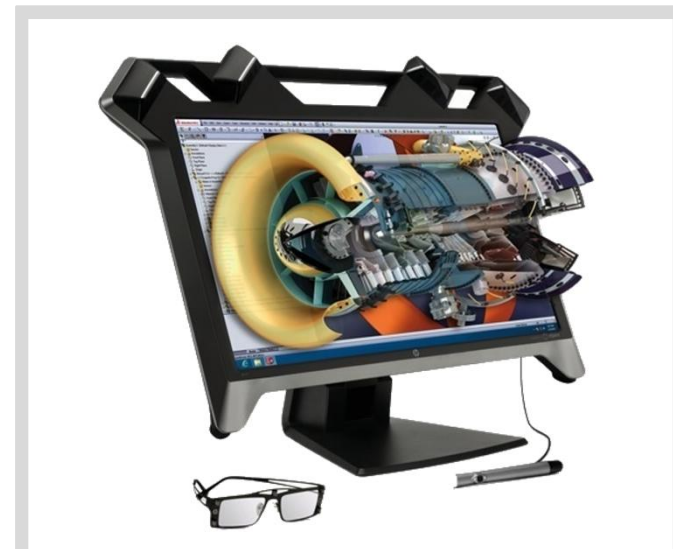
3D Display Technology

- Models are generally created in 3D, but often displayed in 2D
- Presenting a 3D view of a model adds greatly to the sense of realism.
- Requires different images to the two eyes



3D Display Technology

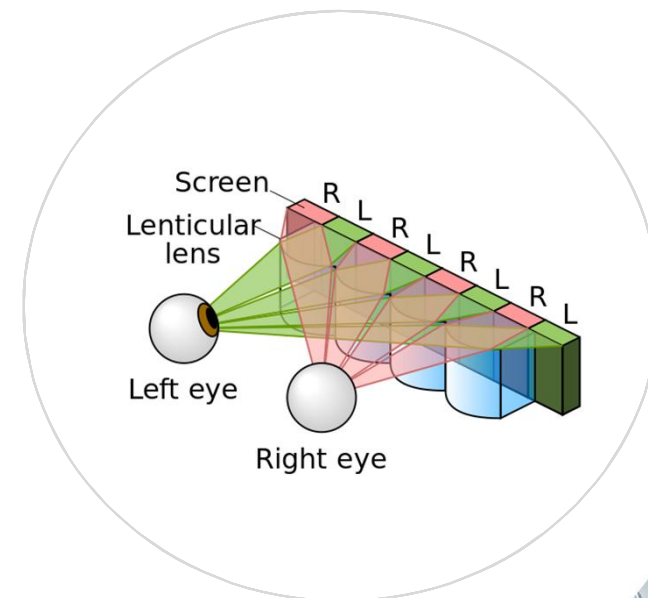
- Shutter glasses
 - User(s) wear glasses that select one of two images presented sequentially
 - Principle can be applied to a range of monitors and projectors



**HP Zvr 23.6-inch
Virtual Reality Display**

3D Display Technology

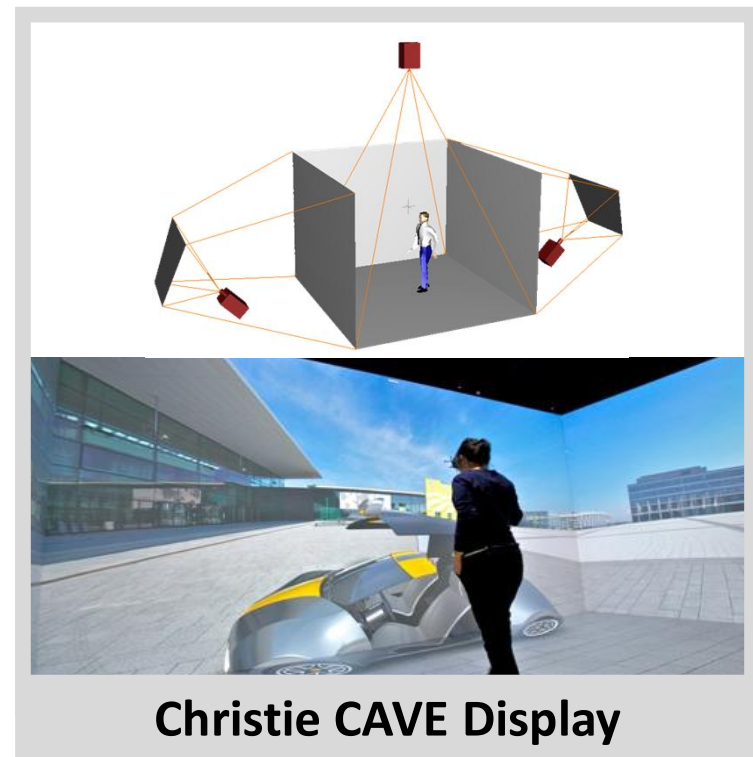
- Autostereoscopic Display
 - Small lenses on each pixel of a display direct light to either left or right eye
 - No need for glasses
 - Limited fields of view and resolution
 - Requires special monitors



CAVE

- CAVE displays use multiple screens and projectors to surround the viewer with 2D or 3D images
- Space for multiple viewers

CAVE="CAVE Automatic Virtual Environment"



Christie CAVE Display

Head Mounted Displays



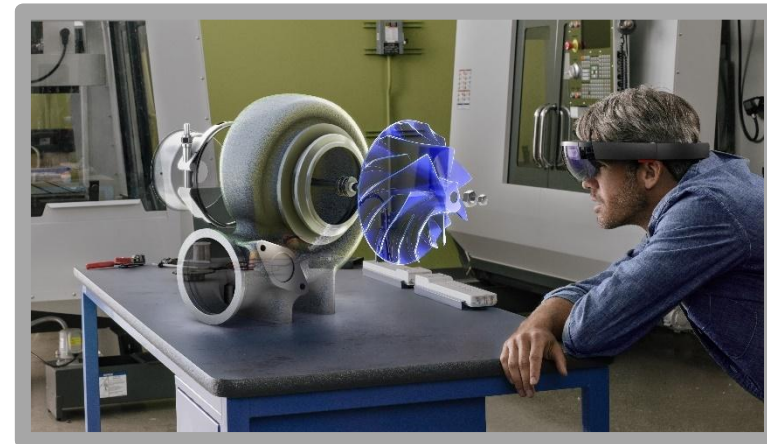
- Increasing field of regard with monitors and projectors requires an array of display devices
- Alternative is a head mounted display (HMD)
- Virtual Reality (VR) HMD
 - Everything in view is virtual – design prevents user seeing the physical world
- Augmented Reality (AR) HMD
 - Virtual objects are seen through semi-transparent optics
 - Alternative is to use video cameras to provide view of physical world
 - Provides simultaneous view of virtual and physical objects



Microsoft HoloLens AR Display



- Microsoft HoloLens is recent AR display
- Fully self contained computer, sensors and display
- Optimized to display and interact with virtual 3D objects in the physical world



Summary



- Monitors have been the standard device for displaying 3D models
- Developments in VR technologies provide alternatives with additional capabilities
 - Full immersion
 - Reduced size and cost compared to projector based solutions
- AR adds ability to visualize virtual models within the physical world
- Both VR and AR technologies are in their early days and capabilities will improve in the coming years





THANK YOU!

