

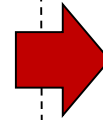
Waveguide Displays

Rob Brown



Head Up Display Background



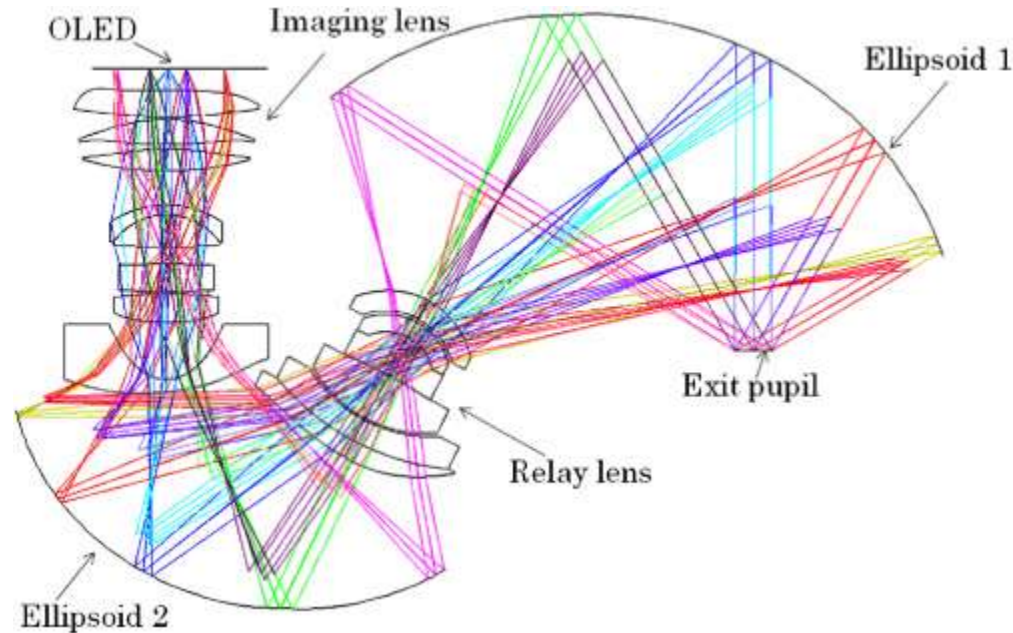
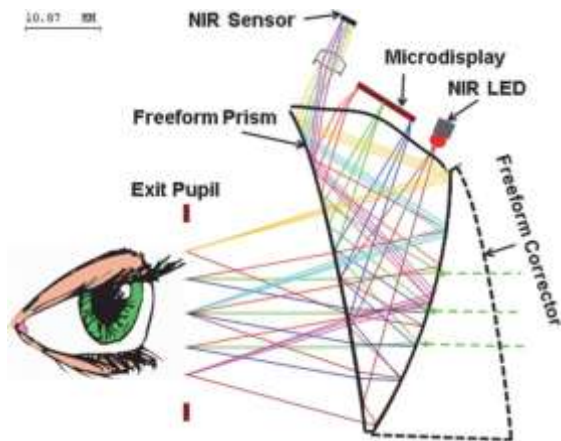
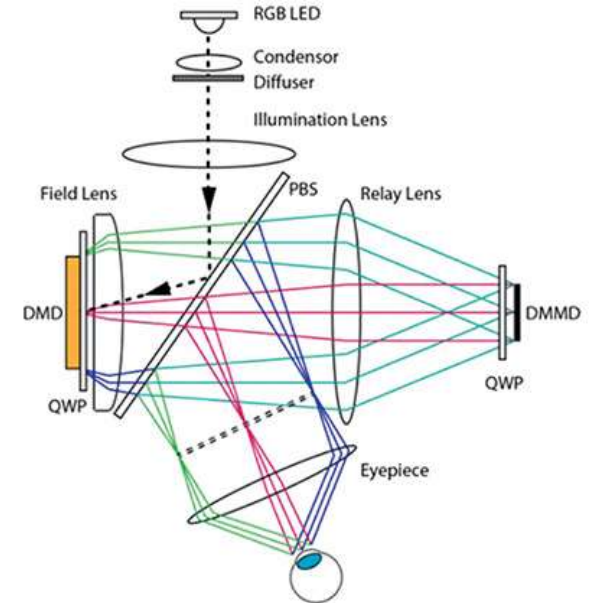


Classical Optics

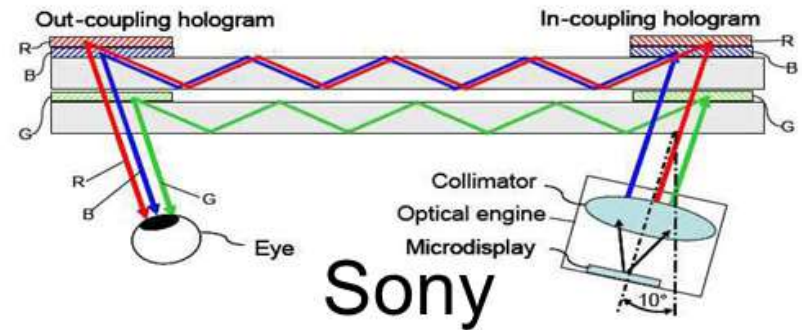
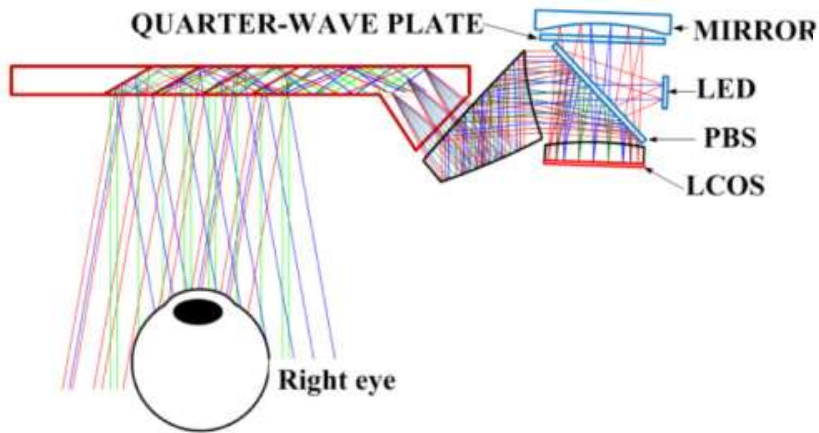


Waveguide Optics

Classical Optics

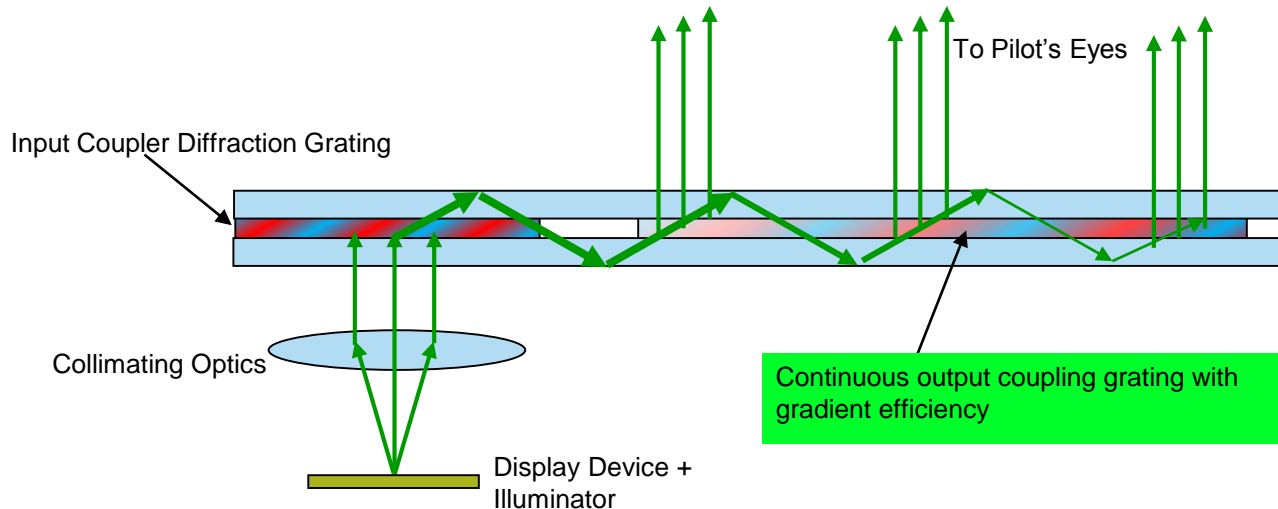


Waveguide Displays



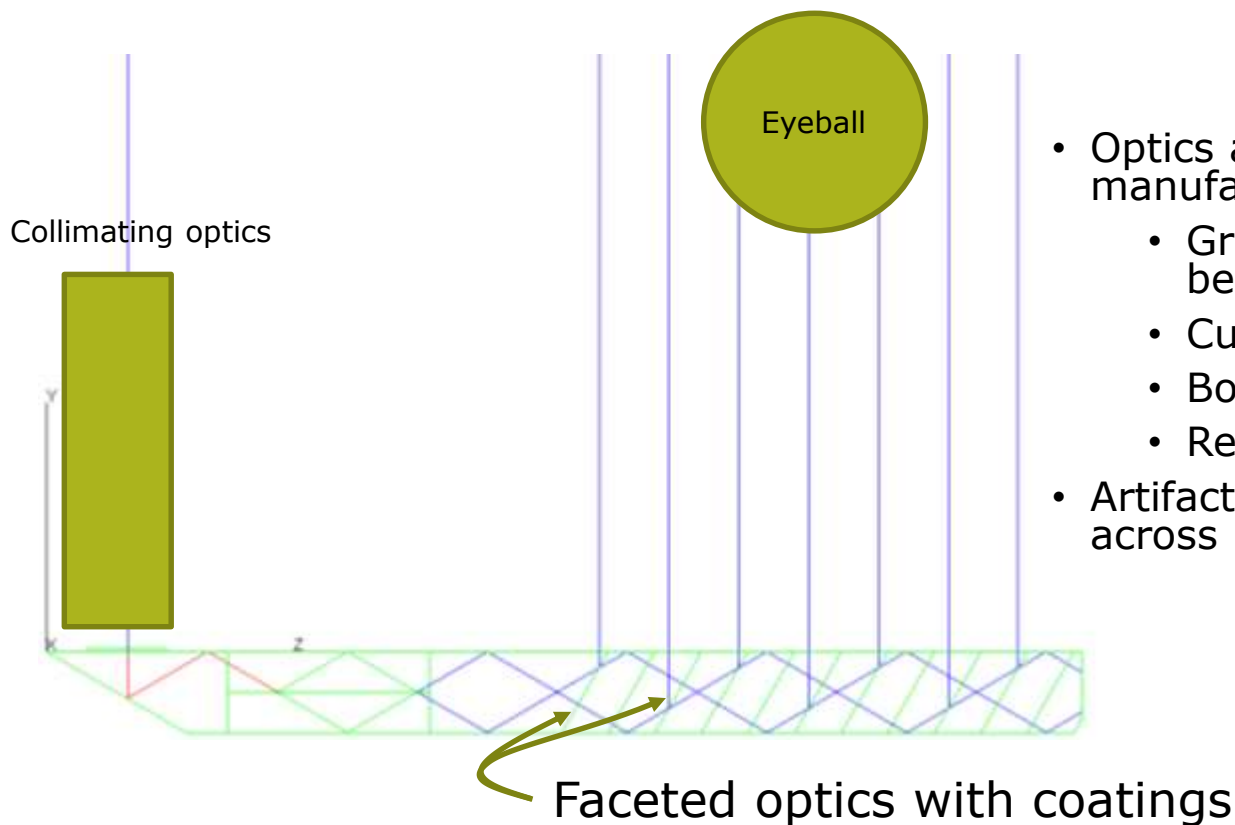
Waveguide combiner using diffraction gratings

- Light from the collimating optics is diffracted at high angles by the Input Coupler diffraction grating.
- Light propagates down waveguide.
- Output Coupler diffraction grating diffracts light out of the waveguide a little at a time, so that it can be seen by the pilot.
- Each bounce produces a virtual image of the collimator, more on that next.



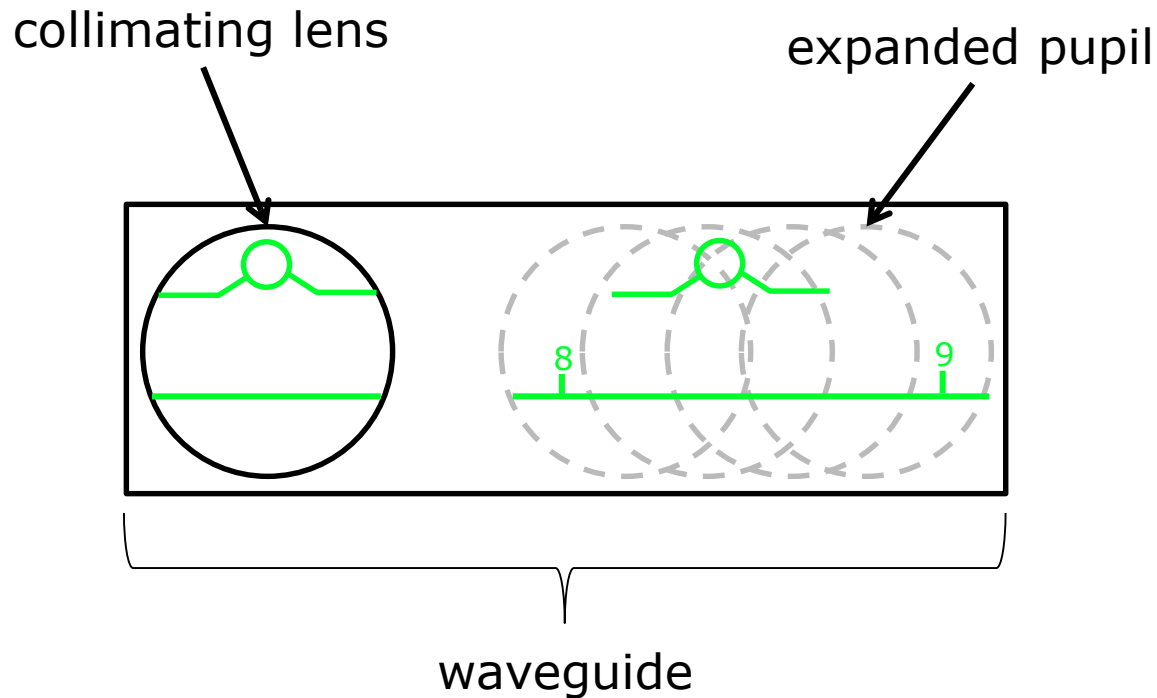
Multiple Beamsplitter Approach

- Beamsplitters can be used instead of gratings:



- Optics are very expensive to manufacture:
 - Grind, polish, coat beamsplitter
 - Cut into many pieces
 - Bond assembly
 - Regrind, repolish, AR coat
- Artifacts such as bands appear across FOV.

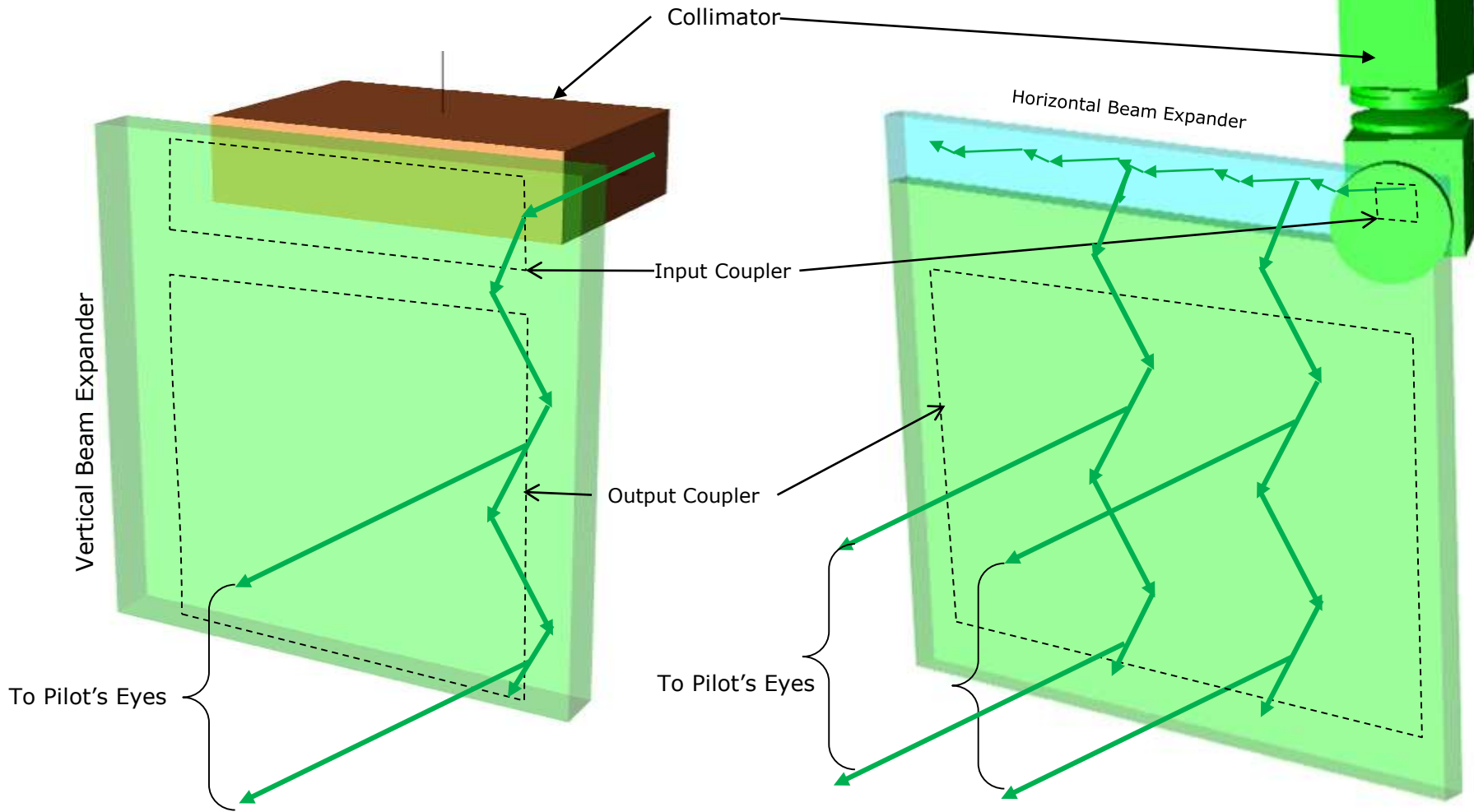
Single Axis Expansion Visualized



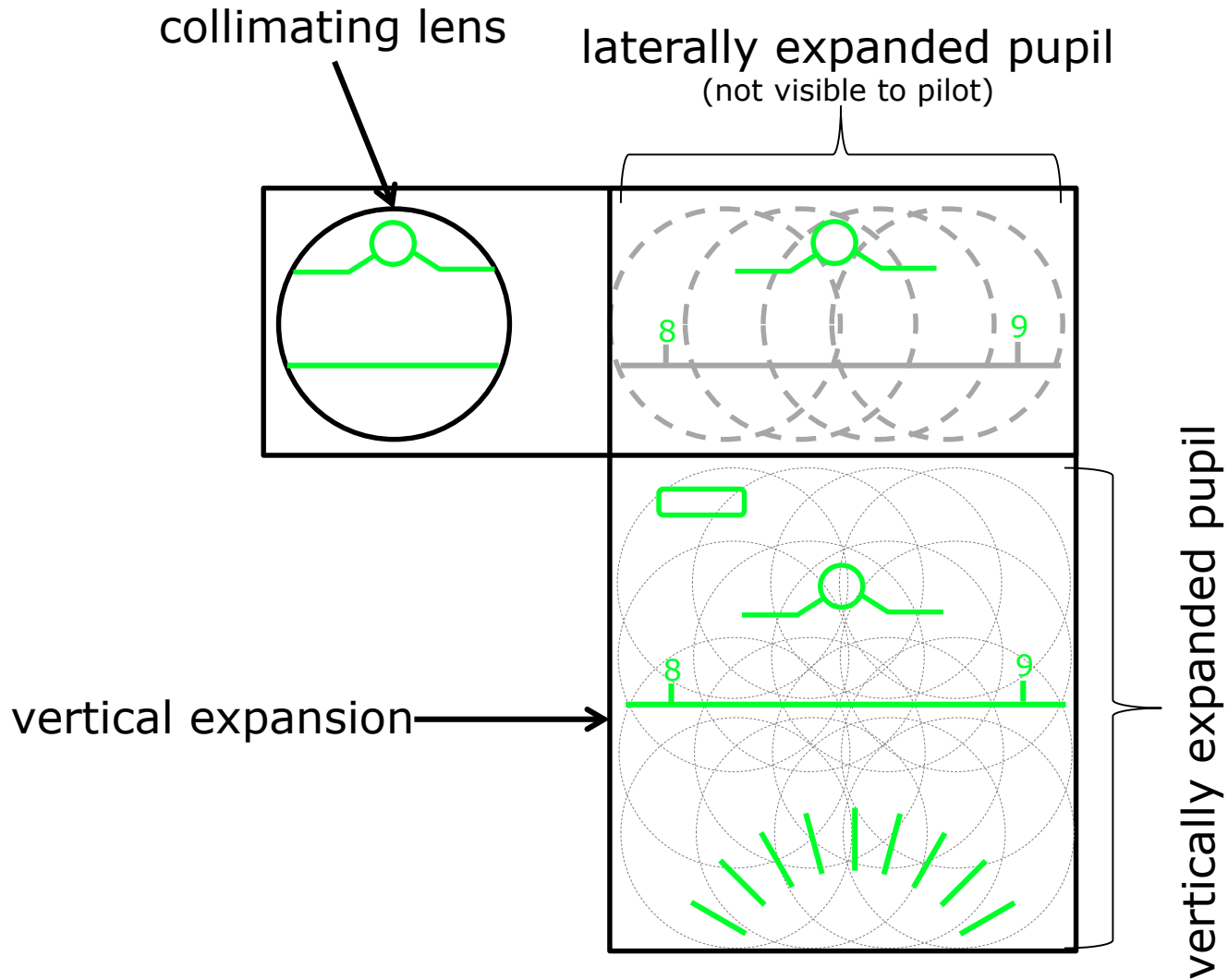
Expansion in two dimensions

Single Axis Beam Expansion
Collimating Optics Aperture is 0.75" x 3.0"

Dual Axis Beam Expansion
Collimating Optics Aperture is 0.75" x 0.75"



Dual Axis Expansion Visualized



Waveguide display for two eyes



Rockwell
Collins



HGS™-3500 Head-up Guidance System



© Copyright 2011 Rockwell Collins, Inc. All rights reserved. Proprietary Information

11