

LED Symposium Way Forward

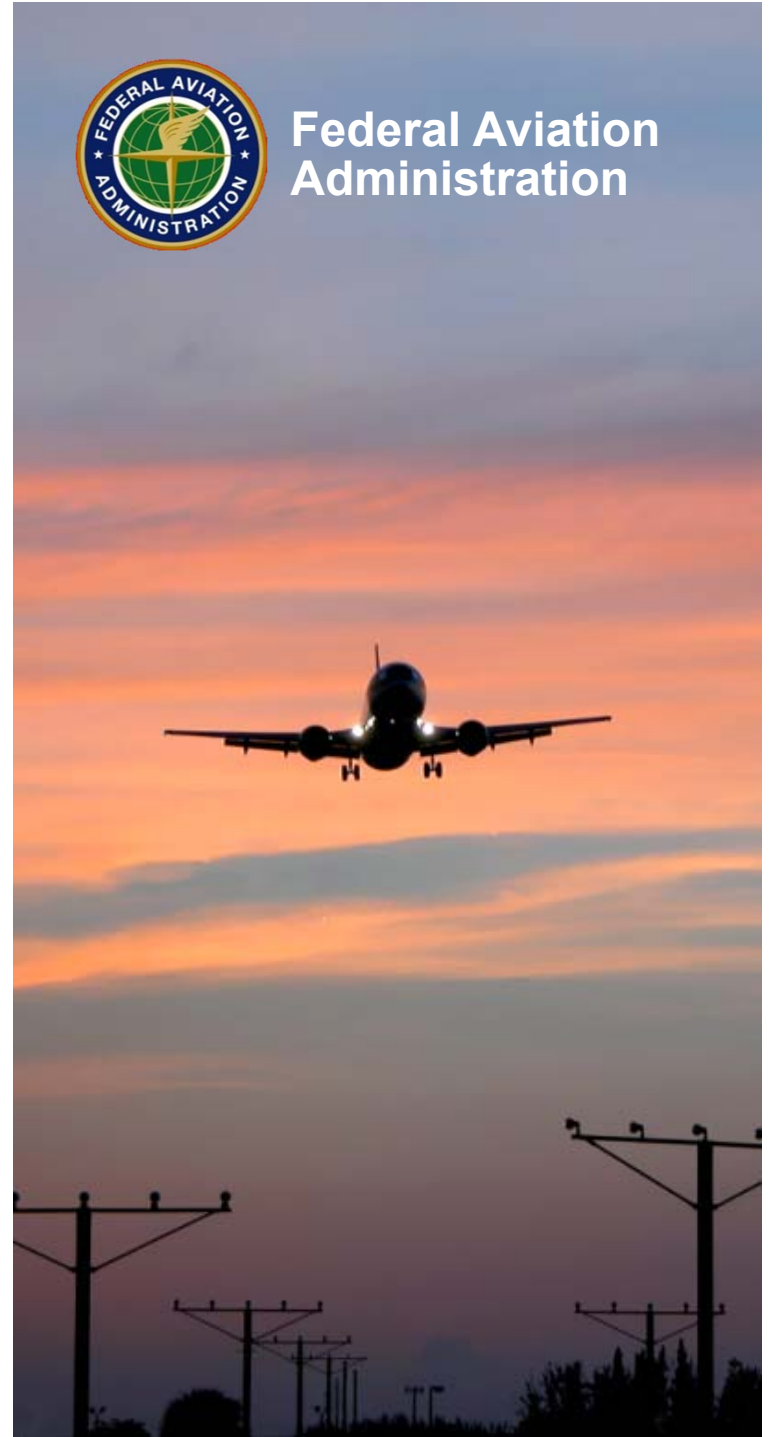
The Near Future for Airfield Lighting Systems

Presented to: IESALC

By: Chris Hope



Federal Aviation
Administration



Testing LED Lighting

- **Raleigh-Durham and Piedmont Triad (GSO) airports, North Carolina**
- **December 14-16, 2015**
 - FAA test crew
- **December 7, 2015**
 - FEDEX 767 (Bob Moreau)



Why Test?

- **2014 LED symposium with industry and FAA**
- **2014 Pilot survey**
 - “The lights are so bright it **floods the cockpit and blinds the Crew** making it impossible to see beyond the lights right in front of you.”
 - “Green LED taxi lighting [is] extremely bright causing **windscreen visibility problem.**”
- **We need to know what we don't know**



Testing Basis

- **Airfields have similar layout, weather and are a short flight apart**
- **Used FAA flight test aircraft and funding**
 - Enabled consistent approaches and approach angle
 - 3 Degree glide path measuring from 500' AGL
- **Focus was on centerline and touchdown lighting (LEDs at RDU)**
- **Tested each approach at steps 1-5 in the air and on the ground**



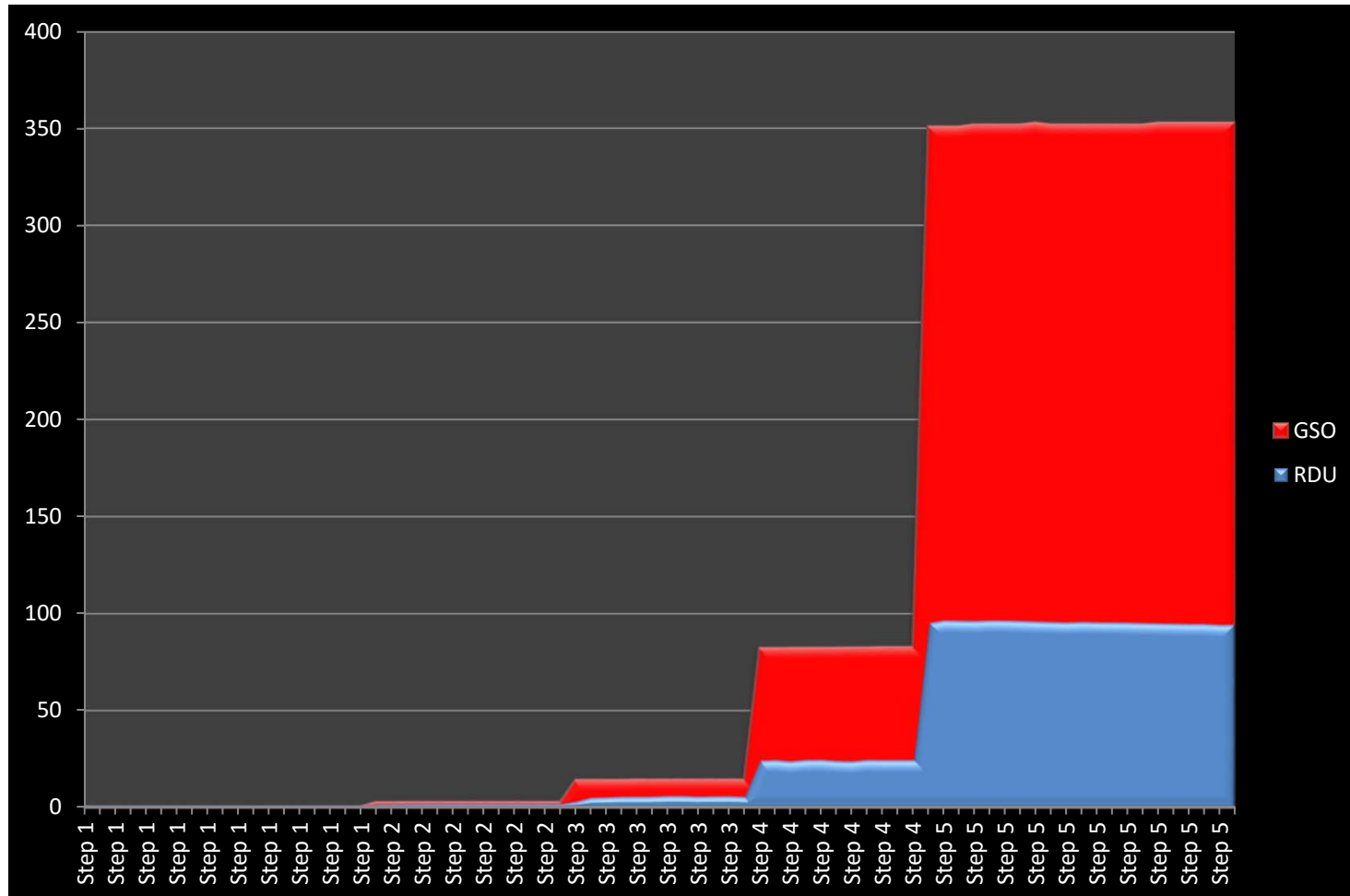
Scope

- **Testing performed after sunset using King Air 300's and a commercial, off the shelf light meter**
- **Crew was also debriefed by test director for data collection on perception of glare, brightness, possible loss of SA and depth perception**
 - All items highlighted by survey, symposium and pilot complaints

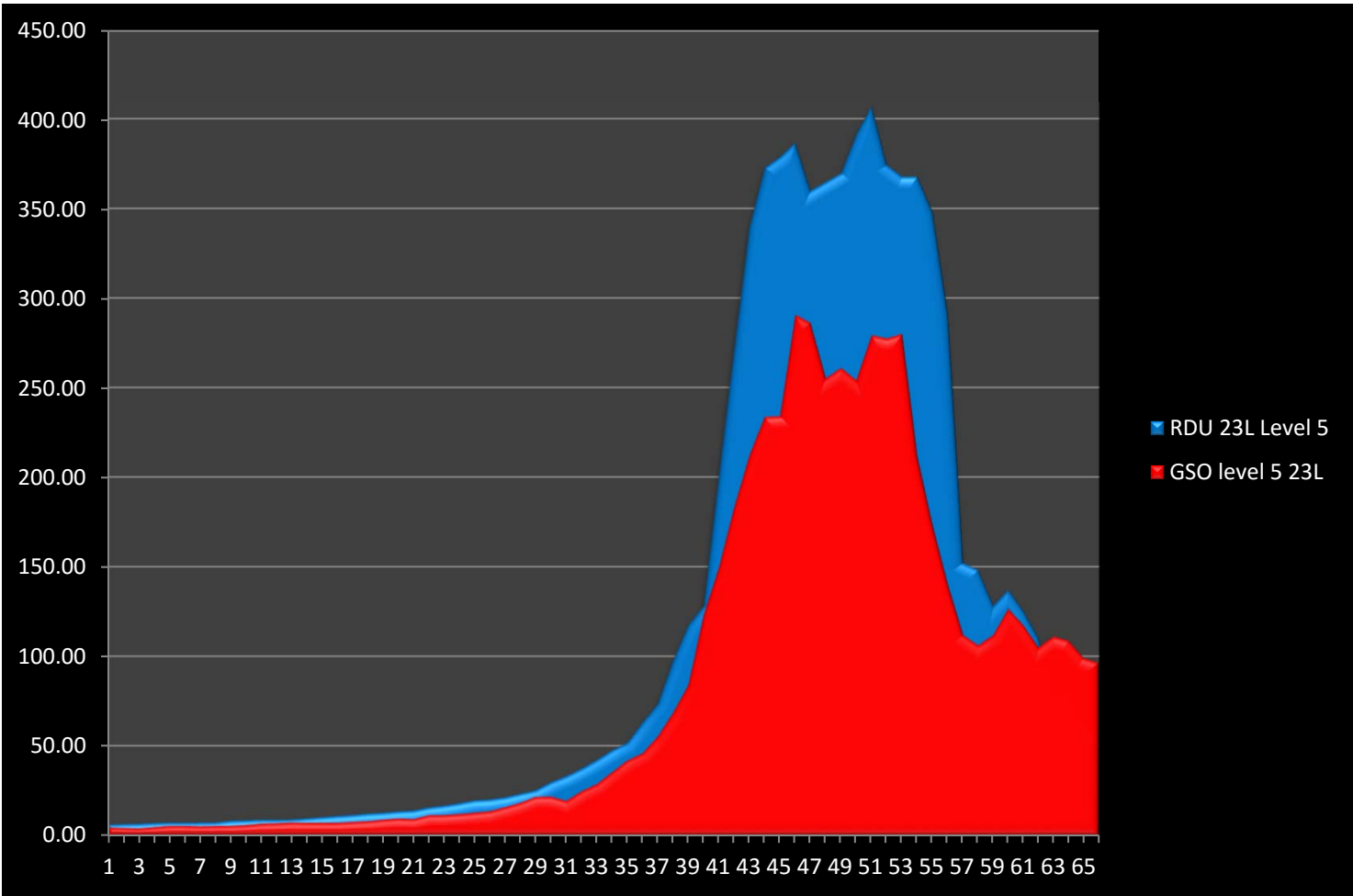
Results

- **We already knew that LED's were bright... but we didn't know how bright**
 - An average of 43% brighter
 - Very sensitive to angular deviations
 - If you leave the center of the beam, light measured drops considerably
 - On a non-scientific note, it *seems* as though we are perceiving these lights to be brighter than they are measured
 - LED's pulse on and off, which may contribute to this
 - Perception can be VERY hard to measure

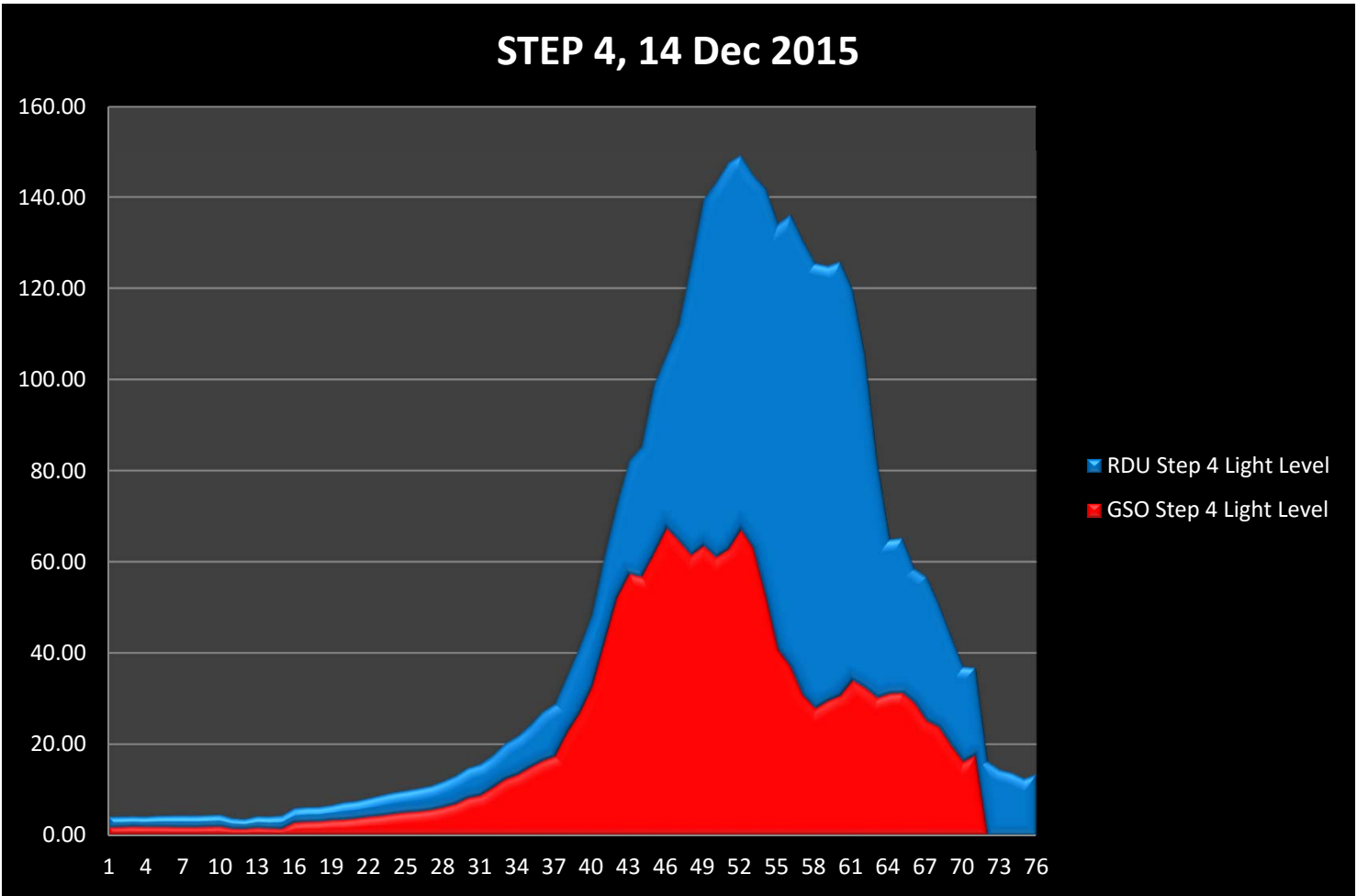
Steps Measured on ground



Step 5 on Glidepath



Step 4 on Glidepath



Subjective Results

- **Aircrew did not report significant issues due to glare, strobing through propeller arc or due to loss of depth perception while transitioning to land**
- **Crew reported that the subjective measurement of the lighting at RDU on the ground was far brighter than that of GSO (the reverse of the measurements)**

Subjective Results, Cont'd

- **Comments on the LED lights at step 4 and 5 included:**
 - “Pavement melting”
 - “Searing bright light”
- **Test crew felt that steps 4 and 5 may be too bright**



The Road Ahead

- **Further testing is required**
 - LEDs and NVG
 - LEDs and EFVS
 - LED Approach Lights
 - Not today, but soon



LED Lighting Way Forward

- **From here, there's more testing to do**
- **We are open to ideas... but industry costs and needs will always drive the train**
 - Incandescent bulbs are going away
 - The FAA will regulate lumens, color/temp, etc; but not IR emissions
- **Questions and comments**

