



# Exercise on FOT results

How to present positive and negative outcomes

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## Presenting FOT results

- *For who?*
  - Who is the audience?
  - How much foreknowledge does the audience have?





## Presenting FOT results

- *Where?*
  - Conference
  - Journal
  - Newspaper
  - ...





# Presenting FOT results

- *How?*
  - Presentation of x minutes
  - Poster
  - Folder
  - Report
  - Text vs. pictures
  - ...



## Cooling Effects of Dirt Purge Holes on the Tips of Gas Turbine Blades

Brian Cough, Jesse Christopher, Erik Heldfeld, and Karen Thole

Gas turbine engines run better at higher combustion temperatures.

At higher combustion temperatures, these engines generate more power and use less fuel. However, these temperatures are restricted by cooling temperatures of the turbine's critical components of the combustion (see Figure 1).



Figure 1. Fuel & Military F-119 gas turboengines.

Dirt purge holes on turbine blade tips allow for higher combustion temperatures.

Hotter hot gases from the combustion zone across the gap between the blade tip and the stator (see Figure 2). Dirt purge holes expel foreign particles from the blade tip so that the cooling holes are not blocked.



Figure 2. Flow of dirt through turbine blade.

The project goal was to find the film cooling effects of these dirt purge holes.

To test the effects, we performed wind tunnel measurements with scaled turbine blades. The wind tunnel was low speed and low temperature, and the blades, shown in Figure 3, were scaled at 12 times their normal size. To measure temperatures on the blade tip, we used an infrared camera. To gap area and amount of coolant flow from the dirt purge holes were both tested.



Figure 3. Scale-up view before tests in wind tunnel.

Temperature measurements were converted to effectiveness.

Effectiveness is the ratio of the temperature difference between the coolant and the surface to the temperature difference between the coolant and the surface.

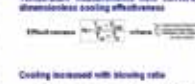


Figure 4. Film cooling effectiveness of Figure 3 shows that cooling increased with blowing rate.

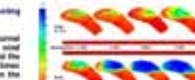


Figure 4. Measurements of the cooling effectiveness.

The size incrementally affects cooling.

In Figure 5, the lateral averages of effectiveness plotted against the axial chord length show that size incrementally affects the cooling.

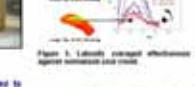


Figure 5. Lateral average effectiveness plotted against increment chord length.

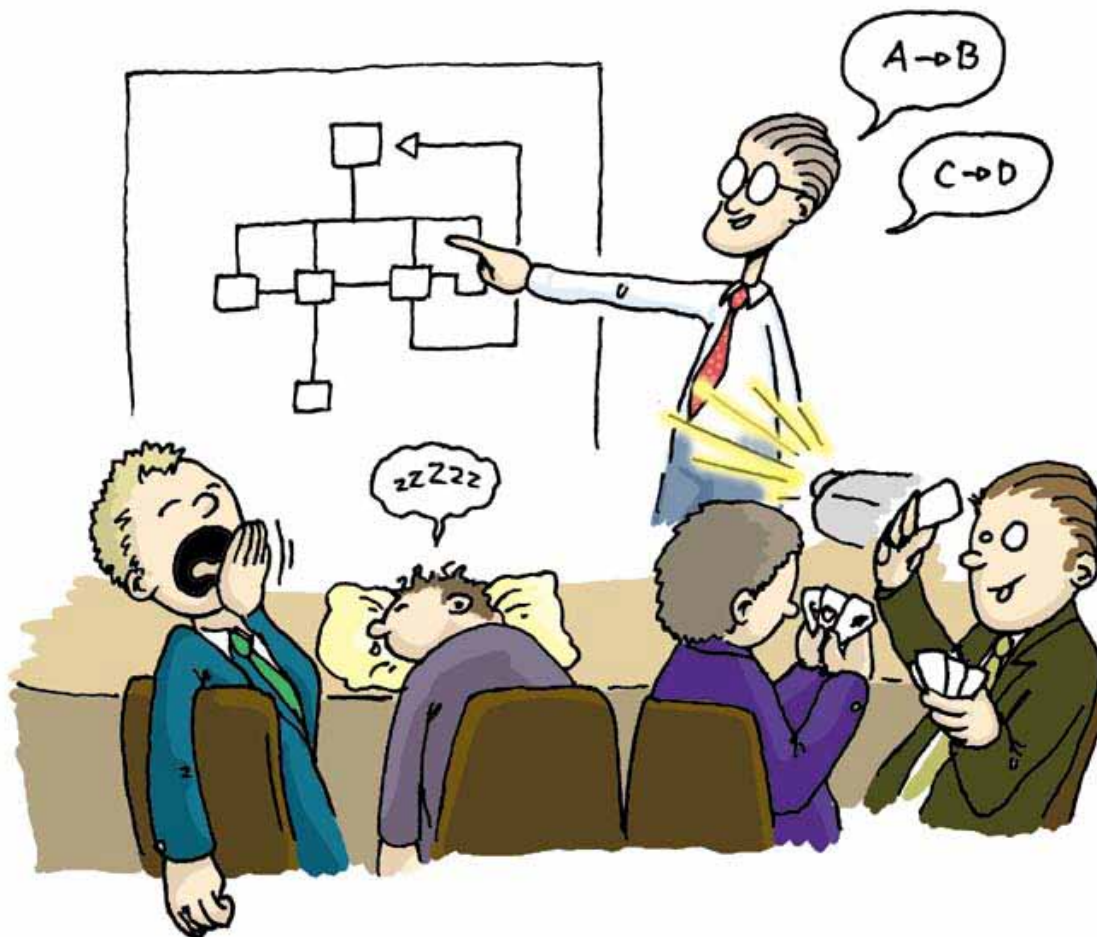
In summary, dirt purge holes provide cooling to the tip surface.

When installed to remove dirt from the blade, dirt purge holes also provide cooling to the tip surface. This cooling is comparable with a scaled tip size as the dirt purge holes the tip region over the leading edge with dirt on.

Acknowledgments  
The sponsor for this project was Pratt & Whitney.



## In the end you don't want this ...





**... but this!**





## Exercise

- Present outcomes of study on a certain system
  - For who: people who work in the field of transport & mobility (researchers, developers, decision makers)
  - Where: conference
  - How: poster OR presentation
  - Time: 4 minutes (sharp!)
- Results are from a simulation study – not a FOT, but the same challenges and difficulties arise when presenting the results
  - *Simulation study was carried out in the ITS Test Beds project*
- Three groups



## Exercise

- Materials:
  - System description
  - Experimental set-up
  - Research questions
  - Results (study level and scaled up level)
- Read exercise and results (5 min)
- Appoint presenter (10 sec)
- Choose focus on what to present (5 min)
- Make plan for presenting the results (15 min)
- Make presentation or poster (10 min)