

The seduction of the absolute prediction

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The seduction of the absolute prediction with an SEA focus

The Seduction of the absolute prediction is
the wish for a perfect prediction system where the measured
response is predicated absolutely.

Issues:

- SEA is a statistical tool predicting the mean of the ensemble.
- All measurements are a 'sample of one' of an ensemble
- All measurements and models have randomness and uncertainty.
- What is 'easily' predicted is rarely what is 'easily' measured.
- What is 'easily' measured is rarely what is 'easily' predicted.



verification of SEA predictions using Quiet Technology Demonstrator Data

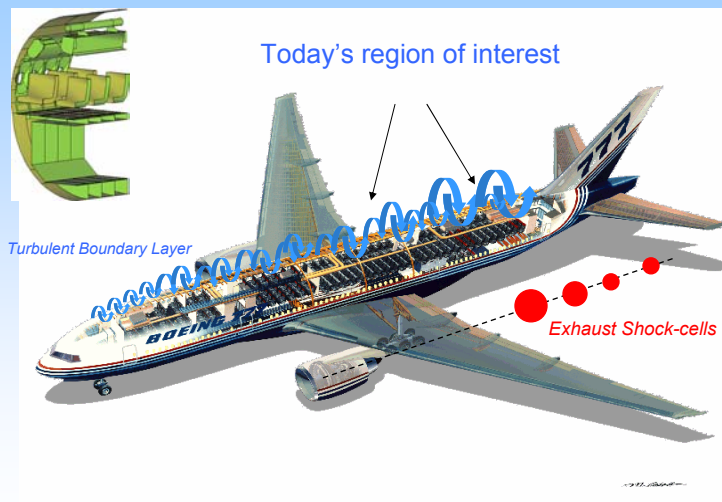


Data set:

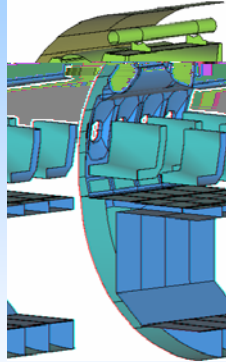
baseline (exterior pressure field & interior seat SPL)
collected to evaluate the noise reduction potential
of engine exhaust nozzle configurations



Exterior Sources



SEA Model Typical Fuselage Section



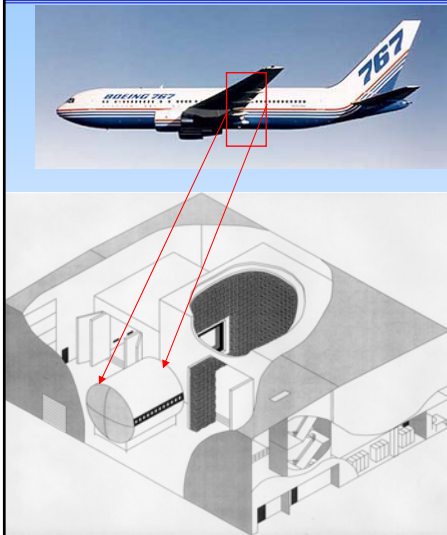
Approximately
400 AutoSEA subsystems

Fore and aft power
flows assumed negligible

Modeling process verified
with laboratory test data

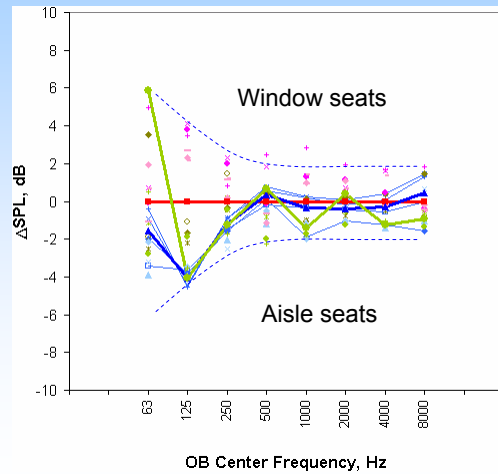
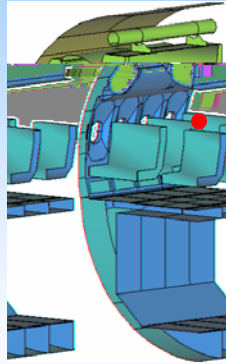


Interior Noise Test Facility (INTF) 767 Fuselage Section



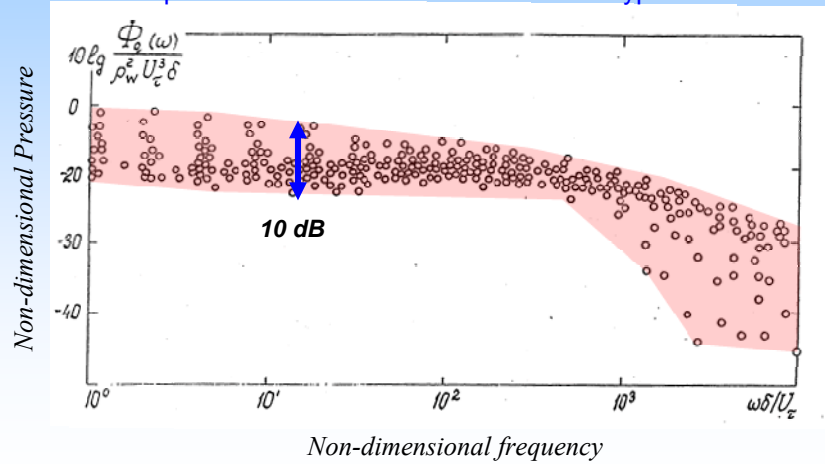
Seat Noise Level in Aft Cabin by Location

Given a single aisle seat what is the volume average SPL?
 Approach look at other airplane data sets

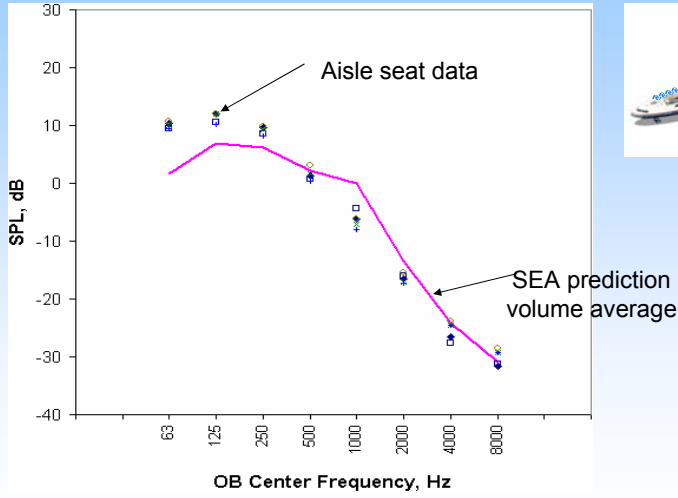


Normalized Measured TBL Spectra (Flight and Wind Tunnel)

Current TBL non-dimensional spectrum
 TBL prediction is based on a 'line' thru this type of data



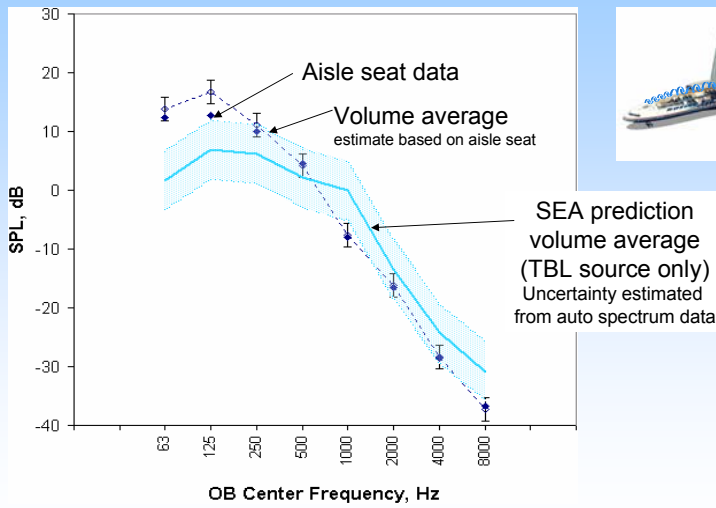
Aft Cabin Flight Idle for Multiple Airplanes



Predictions made using only a TBL source model



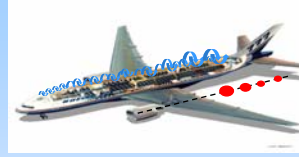
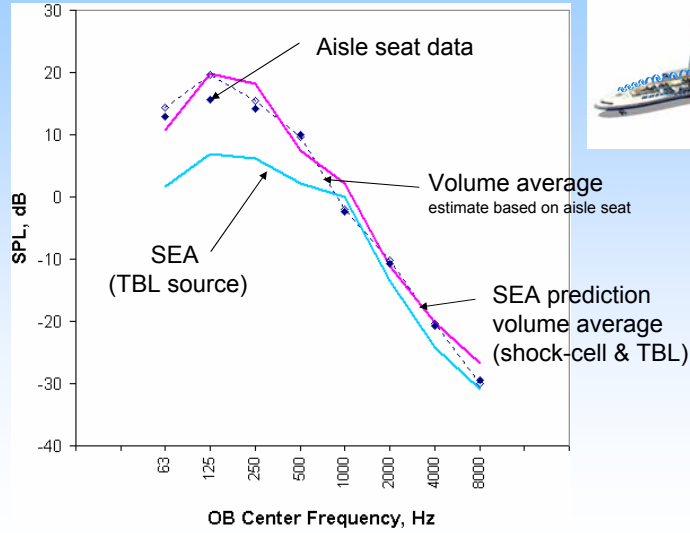
Aft Cabin Flight Idle QTD Airplane



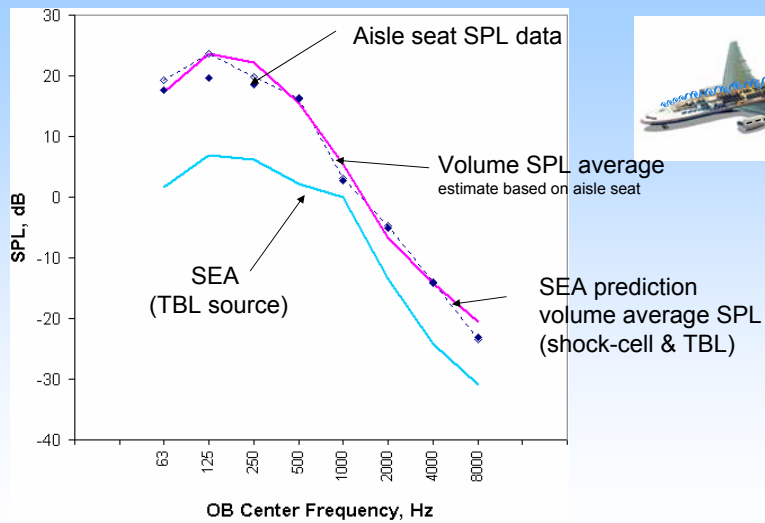
SEA prediction volume average (TBL source only)
Uncertainty estimated from auto spectrum data



Aft Cabin Typical Cruise



Aft Cabin High Power Cruise



Summary

- Model verification of complex systems is difficult.
- Comparisons of predictions to experiments need to apples-to-apples comparisons and that requirement leads to modification of both the modeling and measurement techniques.
- Test must be designed to gather the appropriate information and as much uncertainty /sensitivity information as possible.
- Good new we have better tools and methods than any other time in history and the seduction of the absolute prediction will keeps us an future generations of engineers employed for centuries.

