



Acoustic Propagation

Casey Burley, Dave Conner
Aeroacoustics Branch, Langley Research Center

DARPA/NASA Acoustics Workshop
March 9-10
NASA Langley Research Center

Acoustic Propagation Methods



Increasing Fidelity

Increasing Resource Req.

Characteristic	Ray Tracing (straight & curved)	<i>Gauss Beam</i>	<i>FFP</i>	GFPE
Computing time	Fast	Fast	Slow	Medium
Type	Approximate, semi-analytical	Approximate, semi-analytical	Numerical	Numerical
Frequency range	High Freq.	Low Freq.	Low Freq.	Low Freq.
Accuracy*	Medium	Good	Exact	Very Good
Terrain (imp & elev) & weather	Either or	Both, angle limitation	flat terrain	Both, angle limitation
Shadows & caustics	Boundary	Yes	Yes	Yes
Range dependent conditions	No	3D + Time	No	3D + Time

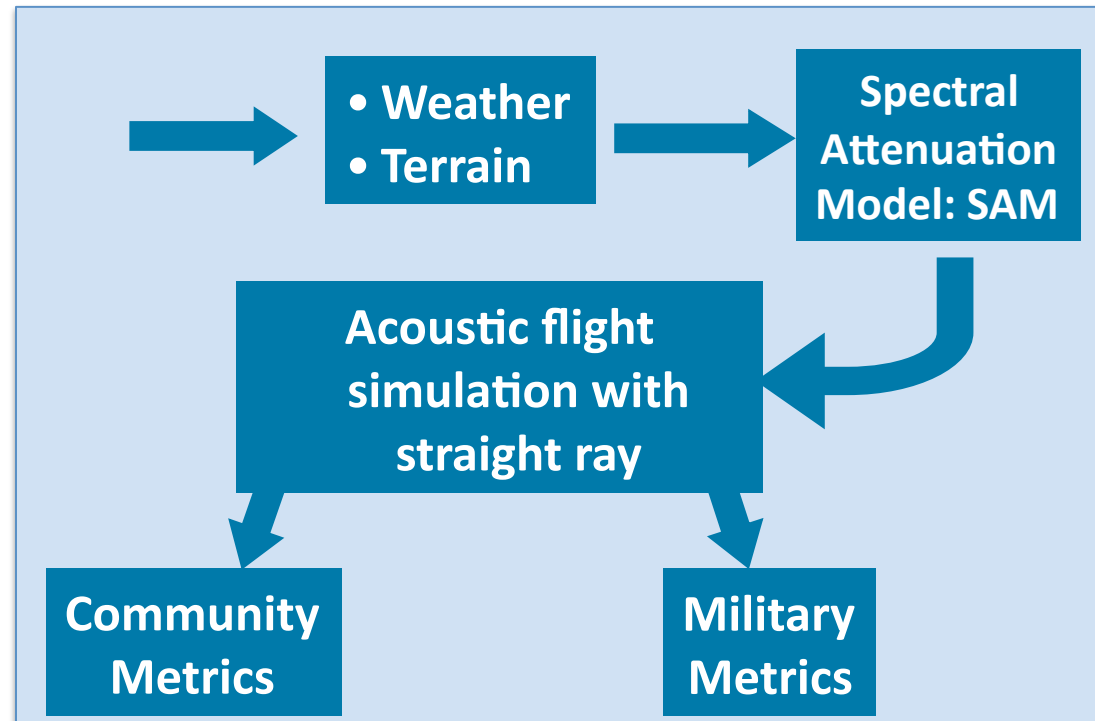
Acoustic Propagation and Emulation Tool: APET



Define Scenario:

- Vehicle*
- Mission*
- Environment*

*3-D, time dependent



- Hybrid acoustic propagation methodology; intelligent selection
- Inputs and outputs: 'standard definition'
- **SAM**: Provides attenuation corrections due to atmospheric and terrain effects as function of (3-D space), time, frequency
 - Curved ray, GFPE, Gauss Beam, FFP
- Validation and application assessment

Acoustic Propagation Modeling



- Capabilities of varying fidelity (computational speed) are required for different applications
 - real-time mission planning to design of flights into airports
- Method development and validation
 - Recognized benchmark problems/w solutions and databases for range of source noise and environmental conditions
 - 3-D, time-dependent weather at low to high altitudes
 - Variable terrain: elevation and ground impedance
- Method application
 - Guidance on model application with accuracy metric and computational cost
 - Error estimates on predicted results, particularly for final acoustic metrics

