Quiet Supersonic Platform (QSP)

2003 Supersonic Aircraft Workshop
13 November 2003
Future Strike Systems Perspective

Current Focus, Cost-Effectiveness Niche

Mach 2.0 --------- Mach 4.0
Sustained Supersonic Cruise

Recent and On-Going Studies
- USAF Future Strike Aircraft
- USAF Next Generation Bomber
- USAF Trans-atmospheric/Future Strike
- DARPA Quiet Supersonic Platform
- USAF Long Range Strike Aircraft (LRSA)
- IDA LRSA Study
- National Aerospace Initiative (NAI)

Emerging NGC 2020-Plus Vision

Supersonic and Sustained CONUS and Regional-Based Global Strike Leveraging Space and Minimal In-Theatre Assets

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Overview
The Quiet Supersonic Platform (QSP)...is directed towards the development of a vehicle capable of long range missions with sustained supersonic flight with low takeoff noise and mitigated sonic boom. Highly integrated vehicle concepts will be explored to simultaneously meet the cruise range and noise level goals. Advanced airframe technologies will be explored to minimize sonic boom and vehicle drag. High performance propulsion systems will be developed to permit long-range supersonic flight with low takeoff and cruise noise levels.

Program Plans
• Develop technologies for long range supersonic aircraft having low sonic boom and noise signature, range augmentation through low vehicle drag, and advanced propulsion systems.
• Develop highly integrated systems concepts for a supersonic long range aircraft.
NGC Proposed Program Vision

**Phase I System Studies**

- USAF ASC/AFRL FSA Studies

**Phase II Tech Demos**

- Conceptual Design

**DARPA QSP**

- M=2.4, 6000 nm, 100 kib, 20% pf, 0.3 psf

**Notional Phase III Flying Demonstrator**

- Validated Tech (F-5E SSBD)

**Emerging National Program**

**Future Strike System**

**Supersonic Biz Jet**

- Breakthrough Technologies To Usher In A New Era of Efficient, Supersonic Time-Critical Transport

DARPA Initiative Provides Opportunity to Focus Resources and Position Nation for Future, Realizable Long-Range, Supersonic Aircraft for Military and Civil Application
## Phase I Development of Design Requirements

<table>
<thead>
<tr>
<th>Sonic Boom</th>
<th>DARPA QSP</th>
<th>Military Strike</th>
<th>Business Jet</th>
<th>Dual-Relevant</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOGw</td>
<td>0.30 lb/ft^2</td>
<td>--</td>
<td>very low</td>
<td>0.30 lb/ft^2</td>
</tr>
<tr>
<td>Range</td>
<td>100,000 lb-class</td>
<td>fallout</td>
<td>100,000 lb-class</td>
<td>100,000 lb-class</td>
</tr>
<tr>
<td>Cruise Speed</td>
<td>M = 2 - 2.4</td>
<td>QSP-consistent</td>
<td>M ≥ 1.8</td>
<td>M = 2.2</td>
</tr>
<tr>
<td>Payload</td>
<td>20% TOGw</td>
<td>QSP-consistent</td>
<td>6k – 8k lb</td>
<td>20,000 lb</td>
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<tr>
<td>TO Noise</td>
<td>Stage 3</td>
<td>Stage 3</td>
<td>Stage 4</td>
<td>Stage 3</td>
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<tr>
<td>Cruise L/D</td>
<td>11</td>
<td>--</td>
<td>--</td>
<td>11</td>
</tr>
<tr>
<td>Cruise TSFCF</td>
<td>1.05</td>
<td>--</td>
<td>--</td>
<td>1.05</td>
</tr>
<tr>
<td>Engine T/W</td>
<td>7.5</td>
<td>--</td>
<td>--</td>
<td>7.5</td>
</tr>
<tr>
<td>Takeoff BFL</td>
<td>--</td>
<td>8000 ft</td>
<td>6500 ft</td>
<td>7000 ft</td>
</tr>
<tr>
<td>X-wind Land</td>
<td>--</td>
<td>30 kts</td>
<td>30 kts</td>
<td>30 kts</td>
</tr>
<tr>
<td>Cruise Alt</td>
<td>--</td>
<td>≥ 60,000 ft</td>
<td>45k – 65k ft</td>
<td>60k – 65k ft</td>
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</tbody>
</table>

### Notes
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## Candidate Concepts

### Exotic Concepts

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
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</thead>
</table>
| G      | • Thermal Keel  
         • Swept-Wing Laminar Flow |
| J      | • Dynamic Energy Addition |
| L      | • Shock Focusing |

### Thin Wings

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>• Laminar Flow</td>
</tr>
</tbody>
</table>

### Multiple Wings

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
</table>
| K      | • Tandem-Wing  
         • Laminar Flow |
| E      | • Joined-Wing  
         • Swept-Wing Laminar Flow |
| F      | • X-Wing Config.  
         • Swept-Wing Laminar Flow |

### Delta & Arrow Wings

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H</td>
<td>• Swept-Wing Laminar Flow</td>
</tr>
</tbody>
</table>

### Boom Shaping

<table>
<thead>
<tr>
<th>Letter</th>
<th>Description</th>
</tr>
</thead>
</table>
| P      | • Laminar Flow  
         • Boom Shaping |
| Q      | • Swept-Wing Laminar Flow  
         • Boom Shaping |
| N      | • Swept-Wing Laminar Flow  
         • Boom Shaping |
| R      | • Swept-Wing Laminar Flow  
         • Boom Shaping |
QSP Phase I & II System Studies

**Phase I (CY 2000/1)**

**Concept Study**

- Global Strike Missionized Vehicle
- "Dual Relevant" QSP Concept*
- Business Jet Missionized Vehicle

**Phase I Goals**

- **Boom**: 0.30 psf
- **TOGW**: 100 klb-class
- **Range**: 6000 nm
- **Speed**: M = 2 - 2.4
- **Payload**: 20 klb

**Key Technologies**

- Low Boom Shaping
- Joined Wing, Laminar Aero
- Top-Mounted Inlet
- Synthetic Vision
- Adv. Sandwich Composite
- Adaptive Cycle Engine

* Body Length 156'
  Height 21'
  Span 58'

**Phase II (CY 2002/3)**

**System Validation**

- Focused On Strike Concept

**Phase II Goals**

- **Boom**: 0.50 psf
- **TOGW**: 125 klb-class
- **Range**: 6000 nm
- **Speed**: M = 2 - 2.4
- **Payload**: 20 klb

**Key Activities**

- Definitive CONEMP Study
- Detailed Vehicle & Subsystem Definition
- Six Wind Tunnel Tests
- High Fidelity CFD
- Adv. Composite Manufacturing Demo
- F-5 Shaped Sonic Boom Flight Test

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NGC Proposed Program Vision

DARPA QSP
M=2-2.4, 6000 nm, 100 kib, 20% pf, 0.3 psf

Emerging National Program

— Validated Tech (F-5E SSBD)

Flying Demonstrator (X-Plane)