Supersonic Research at JAXA

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On behalf of JAXA

Supersonic Research at JAXA

Supersonic Research Programs at JAXA

History of principal programs and flight demonstration projects

FY 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 …

NEXST Program	S3 Program	S4 Program
National EXp. Supersonic Transport	Silent SuperSonic technology	S3 System integ.
Drag Reduction	*Boom/Drag/Noise/Weight Reduction*	*Integration*

Basic Technology Research — *Including joint research activities with NASA, ONERA, and DLR*

Flight Demo. (NEXST-1 Project)

Flight Demo. (D-SEND Project)

● *Flight demo*

● *Flight (#1)*

● *Flight (#2)*

Supersonic NLF Wing Design Concept
(Ref.: ICAS2006, 2010, 2012)

Boom Measurement Technology
(Ref.: ICAS2012)

Low Boom Design Concept
(Ref.: ICAS2014, 2016)

Contributing to the formulation of global standards for sonic boom @ ICAO

ICAO-CAEP-SSTG

NEXST-1 Project (FY1997-2005)

- Objective:
  To demonstrate supersonic drag reduction methods including NLF※ wing design concept
  （※ NLF = Natural Laminar Flow ）
- Principal Results:
  (1) Flight test (@Woomera, Australia in Oct. 2005): Fig. 1 → Detailed results were presented at ICAS2010
  (2) Further research: Fig. 2 → NLF wing design concept was further expanded to High Reynolds Number conditions for a large SST (Ref.: AIAA J. Vol. 52, No. 6, 2014)

Fig. 1

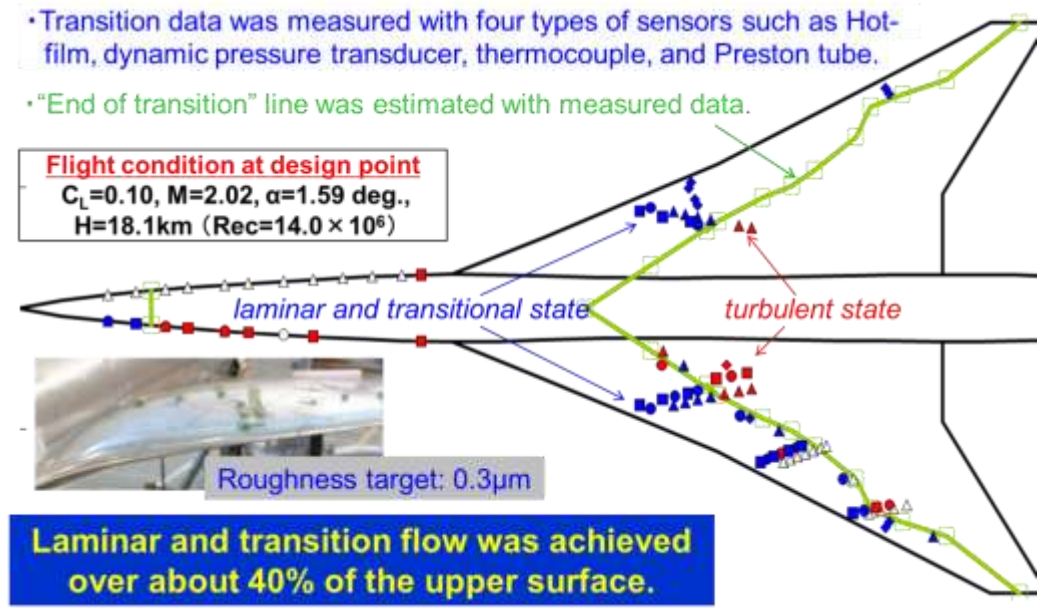
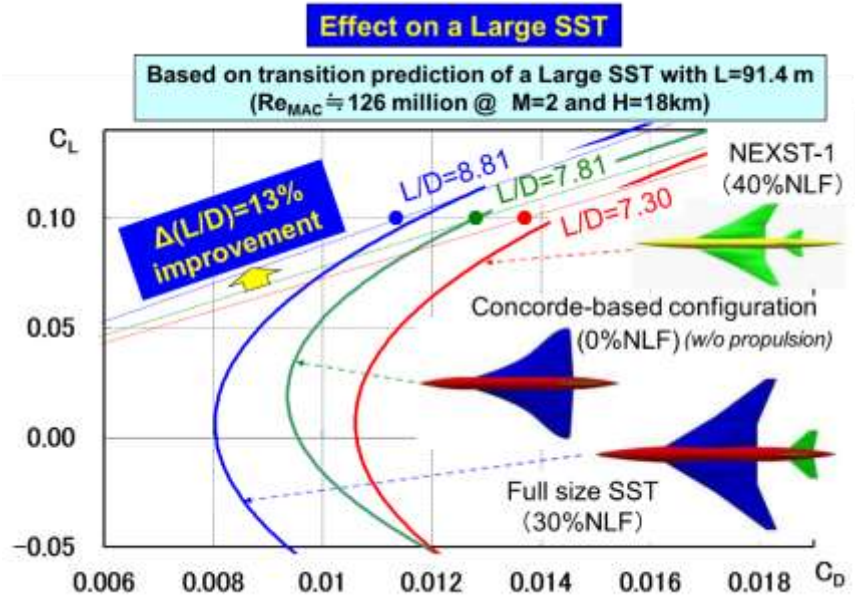


Fig. 2



D-SEND Project (FY2010-2015)

- Objective: To demonstrate low sonic boom design concepts
- Principal Results:
  - (1) Design Concepts: Fig. 3
  - (2) Flight test (@ Kiruna, Sweden in July 2015): Fig. 4 → Low boom design concept was demonstrated by comparing the measured pressure signatures with the predicted signatures including atmospheric turbulence effect. (Ref.: ICAS2016)
  - (3) Further research on boom evaluation: Fig. 5 → Contribution to the discussion of sonic boom acceptance level at ICAO

Fig. 3

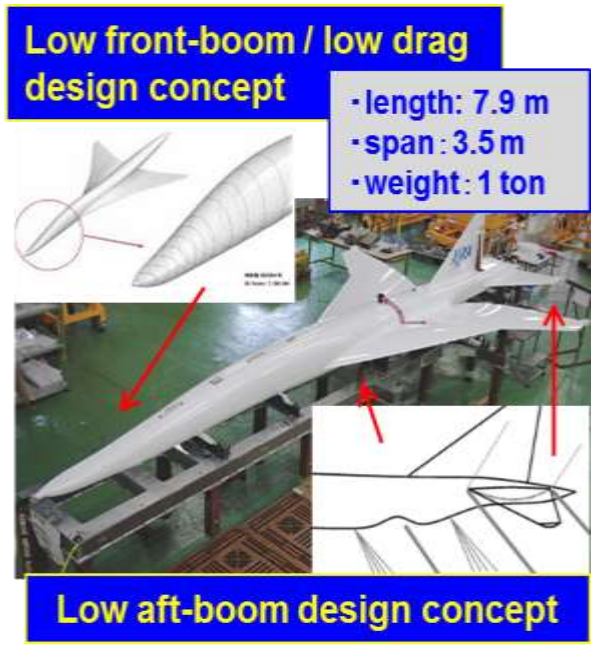


Fig. 4

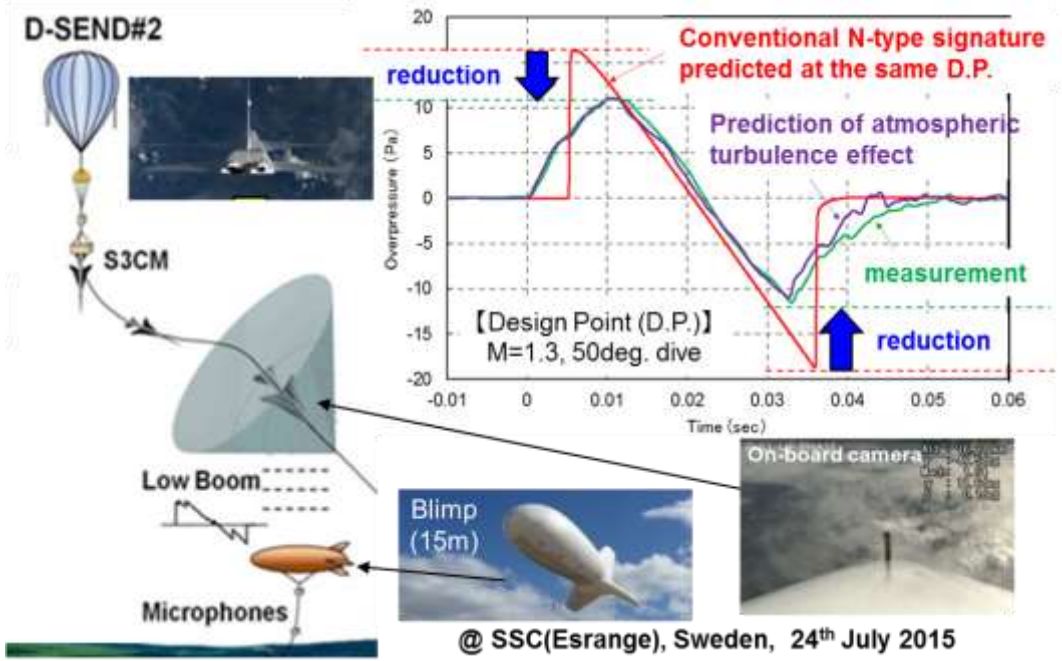
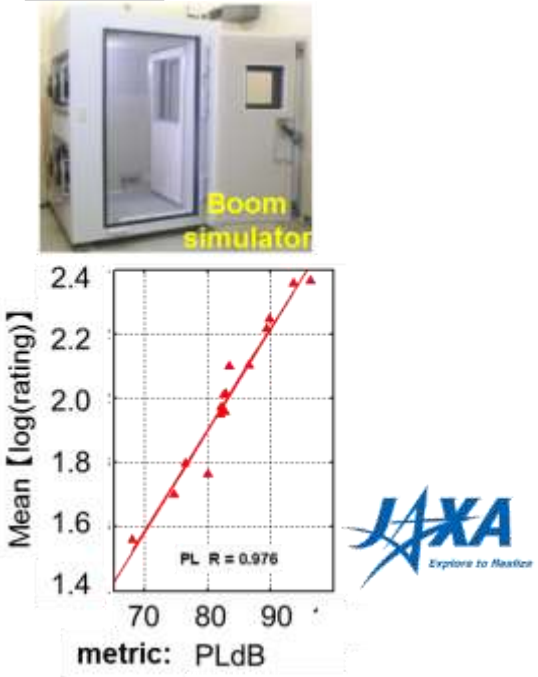


Fig. 5



S4 Program (FY2016-2019)

- Objective: To research and develop the system integration of S3 technologies※1

※1) Low boom & drag design, noise reduction at take-off (T/O) & landing, weight reduction design

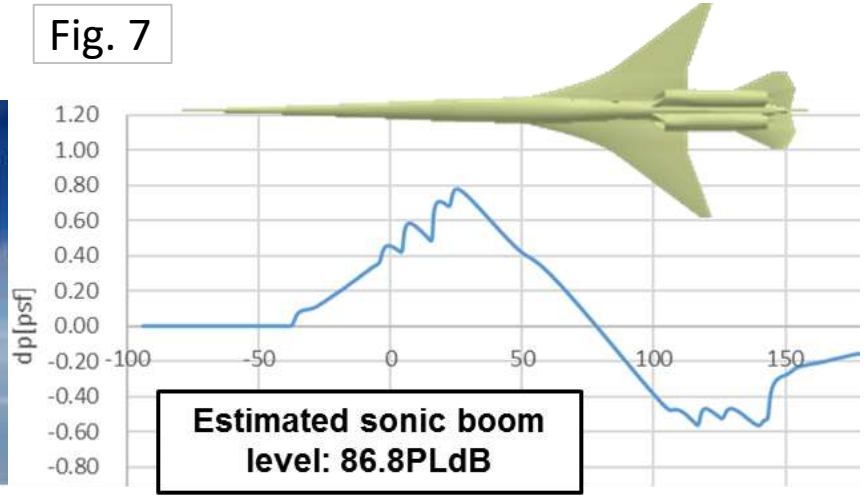
- Principal Results:
  - (1) Technology Reference Airplane and Technology Targets were established: Fig. 6
  - (2) Fundamental research:
    - Fig. 7 → Achieved improved Low Boom Design Concept
    - Fig. 8 → Achieved improved Concepts※2 for reducing T/O & landing Noise

※2) High L/D with optimum Krueger flap, Variable Nozzle

- Next Step:
  - ✈ Aiming to realize a flight demonstration under the current R&D mid-term (FY2018-2025) → Conceptual study of an experimental vehicle with S4 technologies

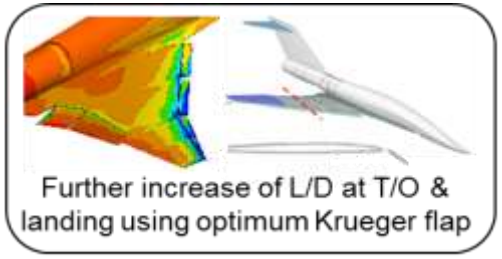
Fig. 6

Fig. 7



Present result on an improved low boom design concept

Fig. 8



Further increase of L/D at T/O & landing using optimum Krueger flap

Low Noise Concept with Variable Nozzle (Japan Patent No.:6183837)

Thank you for your attention!

For more information, visit:

http://www.aero.jaxa.jp/eng/research/frontier/sst/