National Aeronautics and Space Administration

TDT Data Acquisition System Upgrade Efforts

NASA, Aeroelasticity Branch

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Rationale behind a Future TDT DAS

- **New Data system goals** *(summary from requirements document v 7.3)*
  - Retain all abilities of existing OA-DAS
  - Increase scan rate to at least 200 KHz*
  - Increase channel count to 512 channels
  - Increase system reliability
  - Increase user friendliness
  - Decrease or at least maintain the required level of operational support
  - Be compatible with hardware upgrades as much as possible without requiring substantial modification of the core code
  - Improve WOZ capability *(enable EU or Volt WOZ, enable eqn WOZ, archive WOZ data)*
  - Improve in-situ calibration capability *(user friendly, higher order curve fit, automatic spec file generation)*

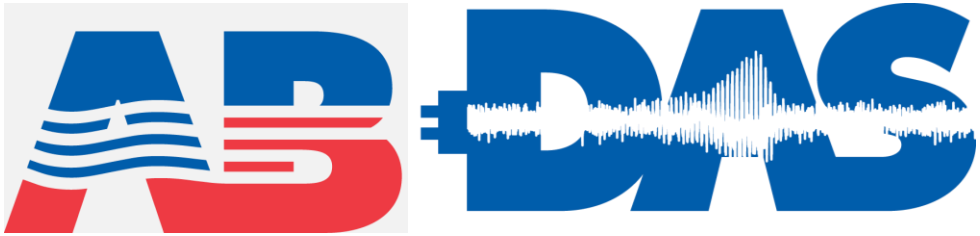
✓ = Already capable

⌛ = Capability planned

- **Hardware:**
  - Precision Filters Inc. Signal Conditioners / Amplifiers
  - National Instruments A-to-D Converters

DAS Implementation Plan

- **Test SLATE option was planned for TDT as a replacement solution**
- **Timeline too prohibitive for scheduled TDT buffet tests (Embraer and SLS)**
  - There was a total cost savings to buy future DAS components and transition the Concept Development Tunnel (CDT) DAS software (LabVIEW) for use in TDT
  - Could be done quickly, compatible with multiple NI systems
  - Limited capability for use with OA-DAS
  - Conceived, developed and managed by:



- **Since development began, AB-DAS has been run in T642, T643, and T645 as a supplemental DAS**
- **Cost analysis done, less expensive to incrementally add capability to AB-DAS in lieu of original Test SLATE option, then transition to facility after development**

AB-DAS Development Phases

- **Phase I**
  - Phase Ia – First Embraer Test (August – October 2013) TDT T642 and T643
    - 100 channels
    - Buffet bandwidth scan rates (12 KHz)
    - Able to do most of the basic features of TDT DAS, has new WOZ capabilities
    - Includes tunnel parameters
    - Informal checkout and documentation
  - Phase Ib – SLS test (March – May 2014) TDT T645
    - 512 total channels, 480 buffet bandwidth (16 KHz), 32 aeroacoustic bandwidth (200 KHz)
    - Included RAID drives to handle large data
    - Informal checkout and documentation
  - Phase Ic – Second Embraer Test (May 2015) TDT TXXX
    - Includes above capabilities plus ESP, circular archive, LAIRD interface
    - Independent tunnel parameter calculation
    - Includes formal ORR and documentation
    - Can run this genre of tests without OA-DAS (i.e. no balance, no digital channels)
- **Phase II – Replace OA-DAS (Fall 2015?)**
  - Meets all goals of AB-DAS development efforts
  - Replaces all capabilities of OA-DAS and more
- **Phase III – Increase capability (TBD)**
  - Slight improvement of some capability to meet user goals
  - Minimal cost beyond phase II efforts

Cost Comparison Summary

	AB-DAS (512 Channels)	Test SLATE (512 Channels)
Hardware, Phase Ic	$1,746K	$1,746K
Cabling, Phase Ic	$363K	$363K
Software, Phase Ic	$281K *(includes NI support)*	$600K
Sub Total	**$2,390K**	**$3,409K**
Hardware, Phase II	$285K	$550K
Software phase II *(includes class C doc.)*	$450K	$4,700K *(includes drivers)*
TOTAL *(Acquisition)*	**$3,124K**	**$8,659K**
Yearly *Maintenance, Licenses, Calibration, Hardware-Reserve*	~$20K	~$27K

Already Purchased

Future Cost

AB-DAS Current Status

- **Finishing Acceptance Test of two versions:**
  - Legacy (single processor)
    - Can support all 512 Channels (max demonstrated rates in excess of 30KHz)
    - Max scan rate with reduced channel count: 400 KHz
  - RFM (distributed processing, uses reflective memory)
    - Can support all 512 Channels at 16KHz
    - Max scan rate with reduced channel count: 50KHz
- **Soon to be an official TDT stand-alone DAS**
- **Planning Phase II development (replace OA-DAS functionality)**

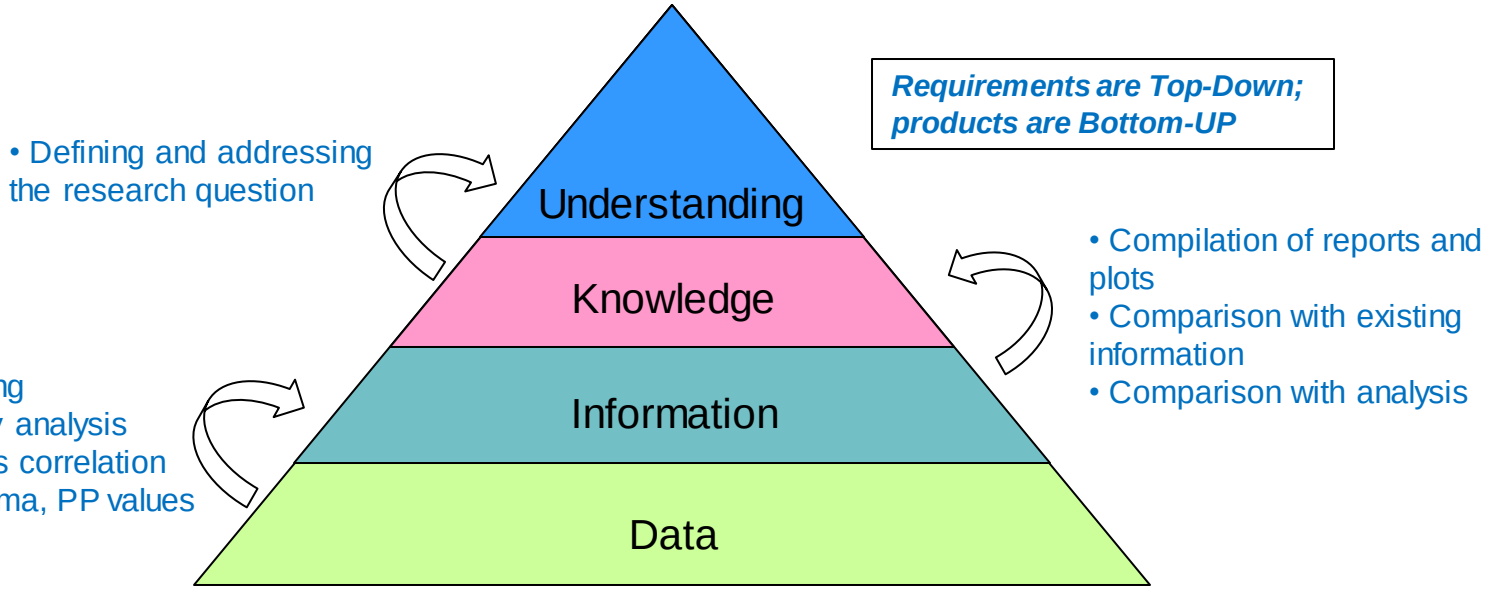
Questions?

AB-DAS

BACK UP

Why AB-DAS vs. Other Systems?

- **Tailored to TDT needs; developed by the end-user, for the end-user**



- **The researcher is involved in all levels of the *Cognitive Hierarchy* and can quickly realize data requirements**
- **AB-DAS utilizes COTS components and interfaces with COTS software developed by the hardware manufacturers**
  - Optimizes programming and capability; less development time/cost and more functionality
  - Reduces maintenance costs, multiple *users* are familiar with COTS software packages
  - Infinitely **tailor-able and adaptable**, can easily adjust to unforeseen future requirements, can easily adapt to **hardware upgrades**

See pages 4, 5