

Burnthrough Update

**International Aircraft Materials Fire
Test Working Group Meeting
March 4, 2009
Naples, FL, USA**



Outline

- **Brief NexGen Description**
- **NexGen Burner Drawings**
- **Recent questions about construction**
- **Recent findings in the lab**
- **Labs that currently have a NexGen burner**
- **Other uses for the NexGen**
- **Materials Working Group Website**



What is a NexGen Burner?

- The next generation (NexGen) burner was designed by the FAA Technical Center to be used as an equivalent burner to the Park DPL 3400 which is no longer in production
- The NexGen burner relies on the same operating principles as the Park DPL 3400, which was designed for home heating purposes
 - Oil burner fuel nozzle, 80° hollow cone, 6.0 gph
 - Air flow approx 1350 fpm exiting draft tube
 - Average flame temperature ~ 1900°F
 - Average flame heat flux ~ 15 BTU/ft²s
- The NexGen burner uses compressed air and fuel to supply the burner, whereas the Park DPL 3400 uses an electric motor to spin a blower fan and mechanical fuel pump
 - Air Flow Metering:
 - Park uses a butterfly throttle valve
 - NexGen uses a sonic orifice
 - Fuel Pressure
 - Park uses pressure regulator on pump
 - NexGen uses fuel tank head pressure
- Major advantages of a NexGen burner:
 - Precise metering of inlet parameters
 - Can be constructed in-house with easily obtainable materials
 - Can be easily modified for future upgrades (as a result of FAATC research)

Park DPL 3400



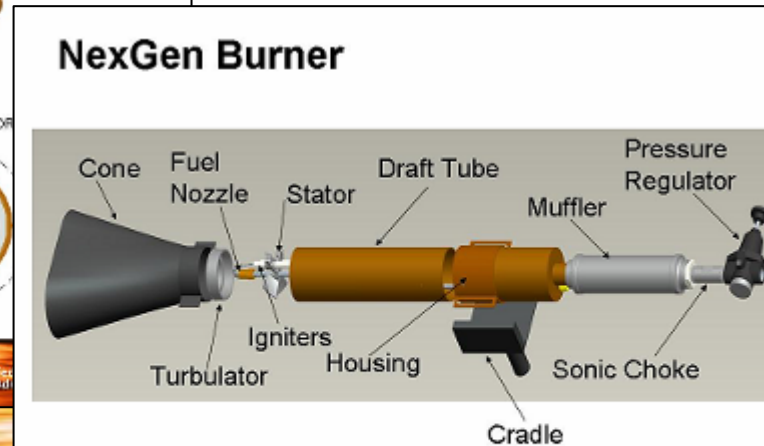
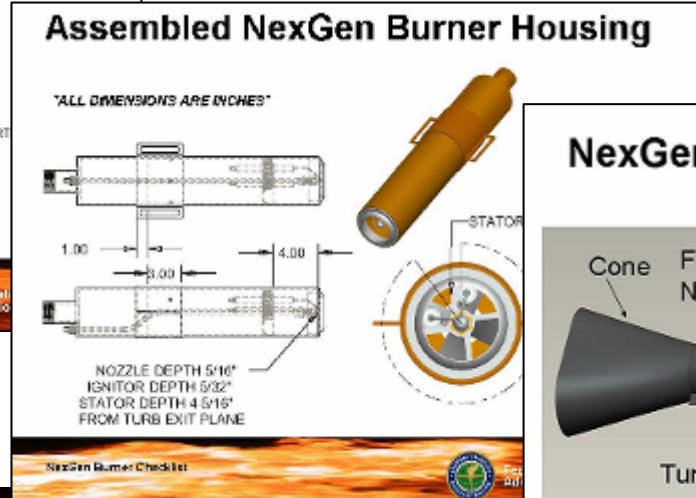
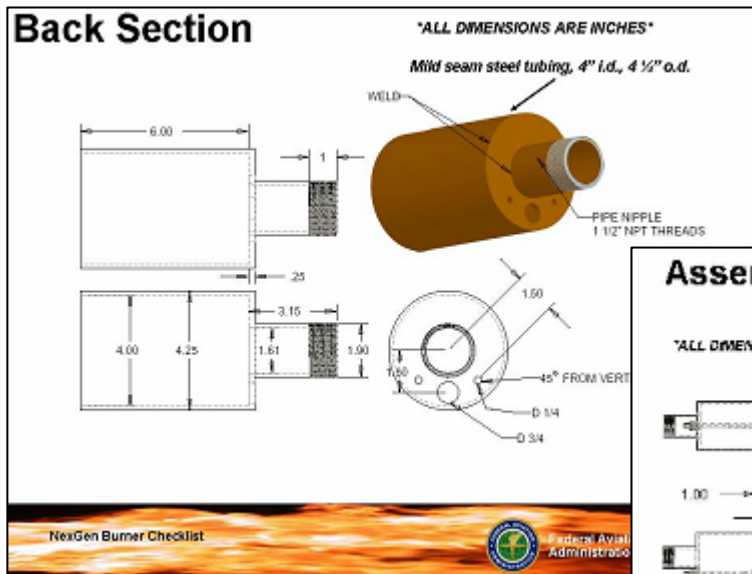
NexGen Burner



NexGen Drawings

- Drawings are available online at

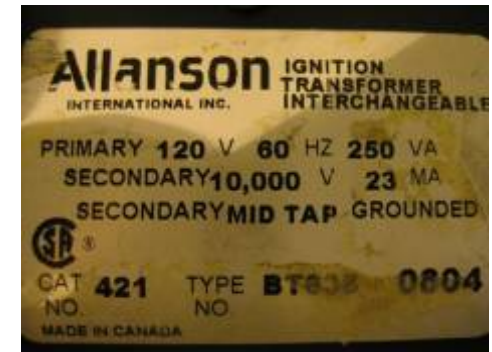
<http://www.fire.tc.faa.gov/pdf/materials/NexGenPlans.pdf>



Burnthrough Update

Recent Inquiries About Drawings

- **Where can the igniters be obtained?**
What is the manufacturer's p/n?
 - We obtained our igniters from Park Electric Motor Co., Atlantic City, 609-344-8058
 - Manufacturer: Westwood Products, South River, NJ 1-800-442-1630,
www.westwoodproducts.com
 - p/n E5-2M5
 - 9/16" insulator diameter
 - 3/16" connector diameter
 - 3/32" electrode diameter
 - 5" insulator length
- **What type of ignition transformer should be used?**
 - 10kV ignition transformer



Recent Inquiries About Drawings

- **What is the preferred method of fuel pressurization? Can a pump be used?**
 - A fuel pump has been found to be equivalent to using a pressurized fuel vessel
 - The output from a standard oil burner shaft driven fuel pump can be routed to the fuel tube inlet on the NexGen burner
 - The main concern is a steady fuel pressure for the duration of a test (120 psig $\pm 2^\circ\text{F}$)
 - The FAA Tech Center has not tested this method, but has witnessed this setup at several labs, and the test results show that it is equivalent to a pressure vessel (fuel flow, flame temperature, and picture frame test results)



Recent Inquiries About Drawings

- **Heat exchange system**

- Part number given for the heat exchanger was found to be invalid
 - Should be McMaster Carr p/n 43865K78
- What are the exact dimensions of the cooling system used at the FAA Tech Center?
 - The system used at the FAATC is not a design point, the temperatures measured at the burner inlet are what is critical
 - Each system should be designed considering many factors unique to each individual laboratory
 - Line length
 - Insulated / Un-insulated lines
 - Initial fuel temperature (in vessel or reservoir)
 - Initial air temperature (large or small compressor tank)
 - Water pump flow rate
 - For the FAATC, the system has these dimensions
 - Insulated cooler, 72 qt. capacity, filled with ice/water mixture
 - Submersible pump used to circulate ice water from cooler, through heat exchanger, and back to cooler
 - Copper tubing used to route fuel through ice water
 - » Approximate cooling surface area of 390 in²



Recent Inquiries About Drawings

- **Reticulated foam muffler insert**
 - Manufacturer: Foamex
 - Type: Polyurethane Safety Foam for Aircraft Fuel Tank Explosion Suppression
 - Density: 1.20-1.50 lbs/ft³
 - Pore Size: 21.5-33 ppi
 - Air Pressure Drop: 0.26-0.36 in. H₂O (0.009-0.013 psi)



Recent Inquiries

- **Are NexGen burners available from the FAA?**
 - The FAA agreed to build several NexGen burners and loan them out to participating laboratories to assist in our research and to make burners available to airframe manufacturers and their suppliers in order to meet the rule. Since the rule has been extended and all manufacturers have access to a burnthrough lab to test materials, the FAA has made the drawings available for labs to construct burners.
- **Can a NexGen burner be purchased from the FAA?**
 - The FAA is unable to accept payment for a NexGen burner. Burners may become available for purchase from private companies.



Recent Inquiries

- **What laboratories currently possess a NexGen burner?**
 - Boeing Commercial Airplanes, Seattle, WA
 - The Mexmil Co., Santa Ana, CA
 - Airbus, Bremen, Germany
 - Jehier-Hutchinson, Chemile, France
 - Centre D'Essais Aeronautique De Toulouse, France
 - Labs that have a NexGen but have not yet been visited by FAA to check performance:
 - Embraer, Sao Jose Dos Campos, Brazil
 - AccuFleet International, Houston, TX

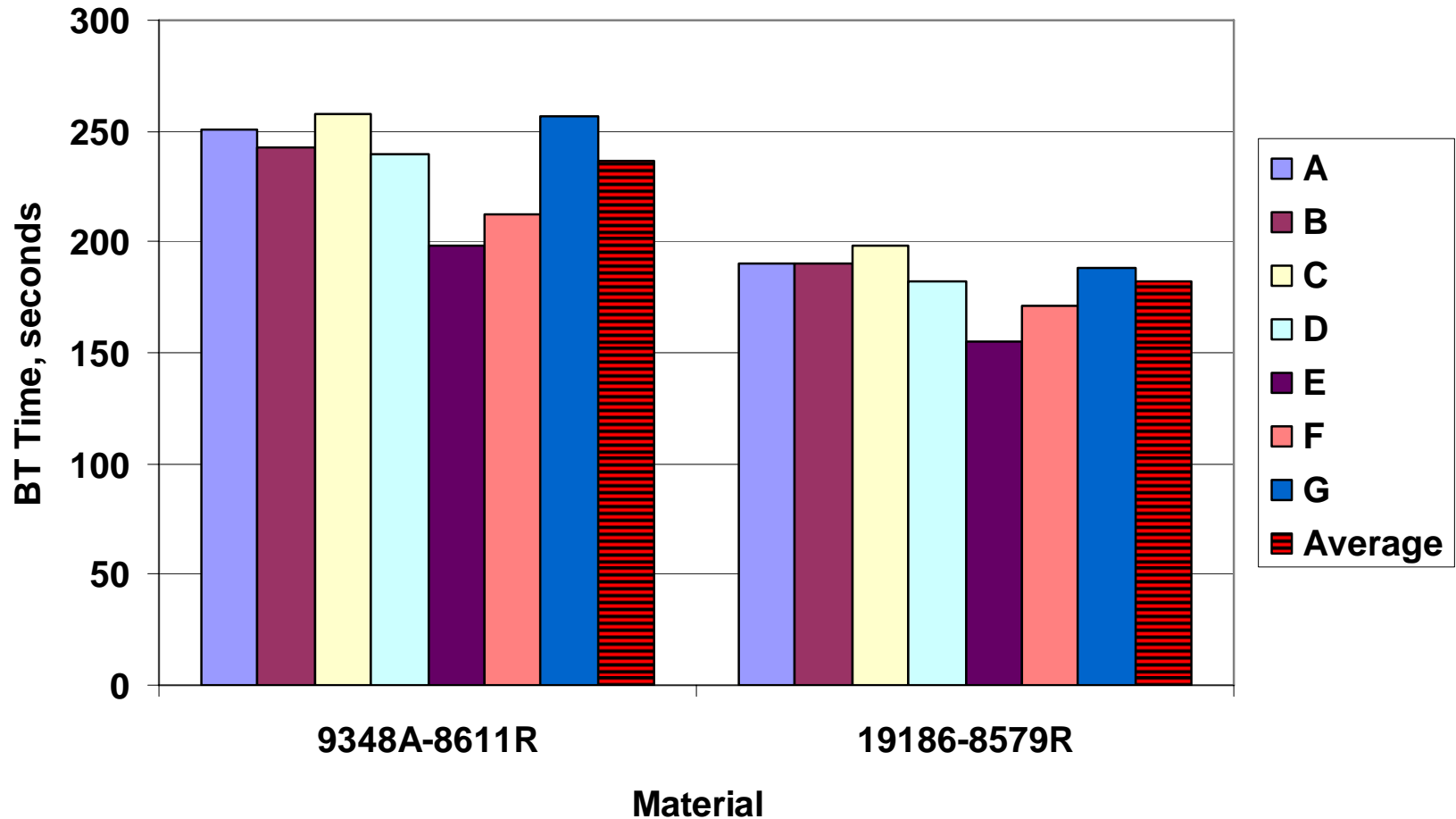


Recent Inquiries

- **Who is looking to build a NexGen burner?**
 - The FAATC has had several inquiries from different companies looking to construct a burner
 - Centro de Tecnologías Aeronáuticas (CTA), Spain
 - Cirrus Design Corporation, Minnesota
 - The Govmark Organization, New York
 - Certification Centre «Quality» and Central Institute of Aviation Motors, Russia



Recently Acquired Data



- RR data compiled from mini-Euro RR in May 2008 and mini-USA RR in Jan 2009
- Results are more scattered than initial measurements
- Overall %SD of ~9%
- Investigation into weathering of material
- Search for alternative materials to use for performance checks on pic frame

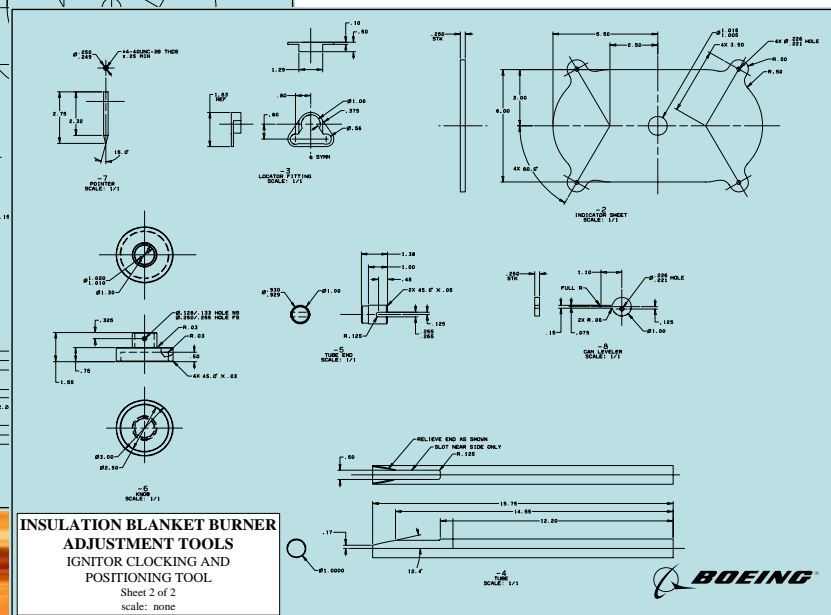
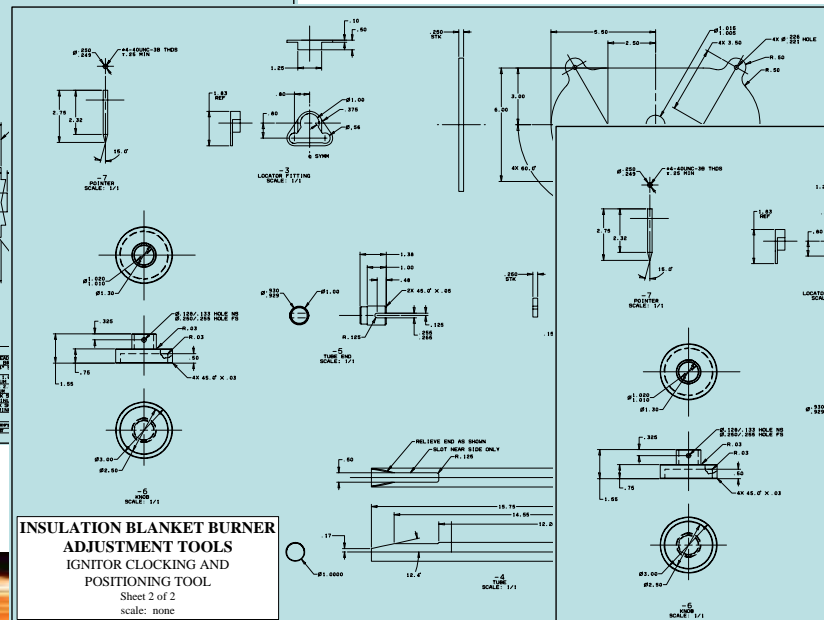
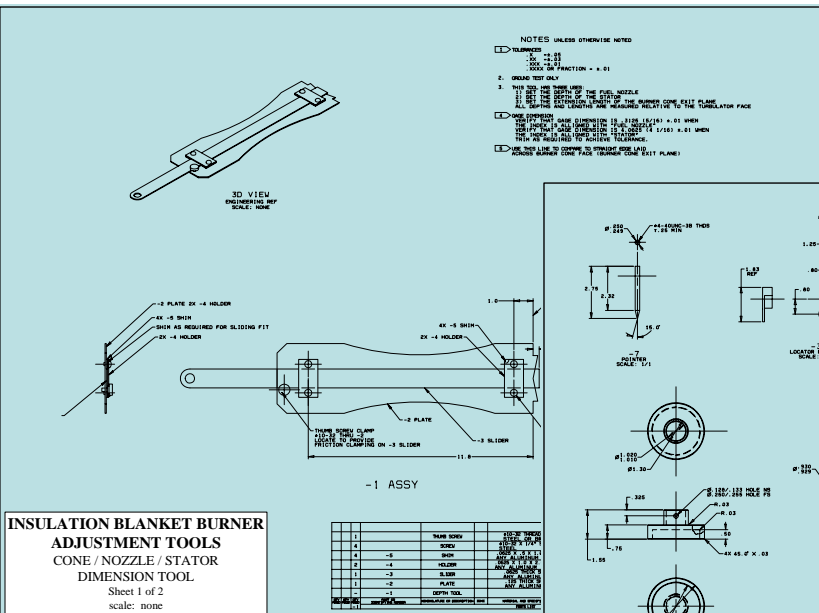
Other uses for NexGen Burners

- Seats
- Cargo Liners
- Powerplant hose assembly and fire penetration



General Burnthrough Information

- Where can the drawings be found for the Boeing-designed oil burner measurement tools?
 - The drawings are in a presentation from the June 2003 IAMFTWG meeting in Hamburg by Noel Spurlock from Boeing
 - [http://www.fire.tc.faa.gov/ppt/materials/BOEING BLANKET_BURNER_PROCEDURE.ppt](http://www.fire.tc.faa.gov/ppt/materials/BOEING_BLANKET_BURNER_PROCEDURE.ppt)
 - Drawings are in the last part of the presentation, slides 38-46
 - Updated Materials Working Group website will have direct link to drawings



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