

# UTH Rotor News

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## Recuperation Comes to the Helicopter World

At Heli-Expo 2009 (Feb. 22 to 24 in Anaheim, Calif.), a small booth from Frontline Aerospace was promoting a fascinating application for helicopters of gas recuperator technology — something that has been used for a long time on stationary gas turbines. “Recuper-what?” For anyone who knows anything about turbine engine performance — in which cold air is better than hot air — it sounds strange at first to try to recapture the heat spewing out of the exhaust and recycle it back into the engine. As with anything, a little knowledge is sometimes a dangerous thing. In this case, recycling the exhaust gas usefully makes a lot of sense when you understand what’s being done. The basic principle of a gas turbine is to extract heat energy from burning fuel. Air is compressed by the compressor section and sent to a combustion chamber where fuel is added. The fuel-air mixture burns and a portion of the energy is used to power the compressor. The rest of the exhaust gases are either used for propulsion (a pure jet) or have the energy extracted by turbine wheels. Pretty simple — but consider how much energy is heading out the exhaust in terms of hot gas. If some of that could be put to use, fuel efficiency would increase.

The problem is where to put that heat, and it turns out that the ideal place for putting heat is into the air coming from the compressor before the combustion chamber. For stationary gas turbines (in gas pipelines, ships, etc.) this is done through a complex series of heat exchangers and suitable tubing. For ground-based applications, the size and weight of the heat exchangers are of little significance. However, for helicopters, size and weight are critical issues and have prevented the use of recuperators in the past. **The Micro Fire Concept.** All recuperators involve directing air from the compressor through the heat exchanger (where heat from the exhaust is extracted) and then re-directing the much hotter gas to the combustion chamber. As part of its unmanned aerial system development, Colorado-based Frontline Aerospace, Inc. found that the Rolls-Royce 250 series engines — which power Bell 206 and 407 model helicopters, among others were an excellent fit for its “Micro Fire” recuperator. In the 250 engine series, the compressed discharge air tubes cross right by the exhaust ducts (other gas turbines are considerably more complicated to retrofit).

Why would you want to add heat to the air going to the combustion chamber? Several reasons spring to mind. Better evaporation of the fuel mixture means better combustion with fewer particulates, and hotter air vaporizes the fuel better than cold air. The key reason for a recuperator, however, is that with hotter air, less fuel is needed to bring the combustion gases to temperature and create work. The end result is improved fuel economy: Frontline projects up to 40 percent savings in a steady state. Even if that means, at the end of the day, only a 25 percent improvement in fuel economy, that’s significant. Now, fuel economy may not be a big thing for some helicopter missions, but with the price of fuel being what it is and not likely to come down, for a lot of folks this can be a significant savings. For those involved in loiter missions, such as police operations, it means longer time on station between refueling. The heat exchanger and associated plumbing will probably weigh about 40 to 50 pounds. And the effect on TOT is not yet clear — tests are just getting underway on the concept.

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## July Birthdays!

- Brady Andersen: 7/1
- Cory Manning: 7/3
- Tracy Kofoed: 7/11
- Layla vigil: 7/12
- Blaine Jemmett: 7/15
- Gabe Henrie: 7/30
- Derek Quirl: 7/30

## FAA Tech Center Evaluates Future Fuels

“Initial FAA testing of a future bio-derived fuel shows promise as a possible replacement for 100LL,” reports David Atwood, an engineer working at FAA’s Alternative Aviation Fuel and Engine Test Facility at the William J. Hughes Technical Center in New Jersey. Initial full-scale engine tests have been completed and revealed the fuel displays an excellent resistance to detonation and produces 98 percent of the power produced when operating on 100LL, both critical factors in developing a sustainable environmentally friendly fuel. The fuel technology has been patented by Swift Enterprises. The new fuel is to be made from cellulosic biomass, which uses landfill waste and switchgrass, among other feedstocks

, to ferment acetone from which it then manufactures a 100-plus octane fuel. It should be noted that the fuel the FAA Technical Center tested was made by a refiner in an expensive process and not in Swift’s proposed process. Swift is in the process of developing “proof of concept” pilot plants. According to a proposal it presented to an industry research council last year, Swift proposes the price of manufacturing the renewable fuel will be less than \$2 a gallon. However, this estimate does not include distribution, marketing, and other substantial costs.

The FAA is planning further engine endurance testing on the Swift fuel in 2009 to investigate the effects of higher engine temperatures and potential engine deposit formation. According to Atwood, further testing will be needed on blends of the Swift fuel and 100LL. Extensive flight testing, as well as testing of the fuel manufactured in the actual bio process, will also be required to ensure it is free of harmful impurities or byproducts. Testing for compliance with FAA certification requirements will be the responsibility of Swift and FAA will require the Swift fuel have an American Society for Testing and Materials (ASTM) standard specification (or equivalent).

## Upcoming Events!

- 4th of July Parade
- Idaho Falls Summer Festival July 8-11





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Patrick Danielson began his training in Idaho Falls in April, 2009. Patrick wanted to learn to fly helicopters because of the utter despise of Idaho drivers. Patrick's favorite maneuver to perform while flying are running landings. His proudest aviation accomplishment so far has been his solo—cross country. Patrick's dream helicopter job would be search and rescue in the Pacific North West. "My most nerve racking experience in a helicopter was my first autorotation."

" My favorite experience while flying as been the continuous sense of accomplishment. " Patrick's favorite sport to watch is hockey, or anything where people lose teeth. A 1990 Volvo was Patrick's first car. Fight Club is his favorite movie " it depicts the loss of individuality in modern society." Patrick's favorite thing to read is old college textbooks, or anything by Christopher Moore or Chuck Palahniuk. Patrick enjoys listening to Flogging Molly, The Flight of the Concord, and Bad Religion. Patrick is married, he and his wife Robin have a little boy named Jack who is often referred to as "Jack Incorporated"

Patrick's favorite food is pasta and his least favorite is dog food. His favorite smell is Pumpkin Pie, and there are too many possibilities to narrow down his least favorite smell. If Patrick could meet one person he would meet

" To me flying is ....  
A gateway to a whole new world"

Christopher Columbus, steal his ship and name the new world "Pattopia." For Patrick the glass is neither half full or empty " It's too big!" Patrick also enjoys playing guitar in a punk band and adding art to his portfolio. Patrick's final comment was "Remember the Alamo!"

## Setting the standard for performance and Quality one pilot at a time

- Congratulations! Check Rides, Solos, and New Employees**
- Patrick Danielson: Solo
  - Gabe Henrie: CFII
  - Blaine Jemmett: Commercial
  - Layla Vigil: Solo
  - Ben Michaels: Solo
  - Robert Dennis— Solo

## Kade's Konversation

*A message from Kade Gourley, our West Jordan Director of Operations*



**Financing:**  
For those of you who are trying to get your financing issues taken care of, ask Diane, Darby or Wendy for HELP. They all have the knowledge to help you succeed. If this is your first experience trying to get the funding for your schooling with Utah Helicopter, odds are you will need to have a co-signer. It took me about 2 ½ months to get it all approved.

**Time to finish:**  
This rests solely on you, if you are willing/able to come in more then you should. By coming in more often you will retain the knowledge as well as the motor (piloting) skills better. I know it feels like a lot to take on at first, but I promise that the more you come in the faster you will finish.

**Cost to Finish:**  
Well we know that there are minimums as far as flight experience is concerned, that can't be helped. Unfortunately, it takes 95% of people more than the required minimums, but if you can come in more, your skills don't get rusty as fast (see above paragraph). Other ways to help you keep the cost down

a bit is to make sure you study at home. If you study diligently at home, it shows ; then you and your instructor can proceed to the next lesson sooner than someone who is not studying. I know it is overwhelming at times, just keep plugging away!

The instrument rating is the most discouraging rating we train for, upon completion of this rating it's all down hill. Before you know it the commercial is out of the way. So don't let your troubles, whether it's the financing, time frame, cost or just the overwhelming sensation get you down. Talk to your instructor or office manager for help and we will try to get you through it. Remember the fun and excitement that your future career will hold.