

**AIRFIELDS AND ALTERNATIVE FUELS:  
EXPLORING RURAL AMERICA'S  
TRANSPORTATION INFRASTRUCTURE**

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**HEARING**

BEFORE THE

**COMMITTEE ON FINANCE  
UNITED STATES SENATE**

ONE HUNDRED TENTH CONGRESS

FIRST SESSION

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(DUBUQUE, IA)

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AUGUST 27, 2007

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Printed for the use of the Committee on Finance

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U.S. GOVERNMENT PRINTING OFFICE

WASHINGTON : 2007

48-944—PDF

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For sale by the Superintendent of Documents, U.S. Government Printing Office  
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**AIRFIELDS AND ALTERNATIVE FUELS:  
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TRANSPORTATION INFRASTRUCTURE**

MONDAY, AUGUST 27, 2007

U.S. SENATE,  
COMMITTEE ON FINANCE,  
*Dubuque, IA.*

The hearing was convened, pursuant to notice, at 10 a.m., in the General Aviation/Dubuque Jet Center, Dubuque Regional Airport, 11000 Airport Road, Dubuque, IA, Hon. Chuck Grassley (ranking member of the committee) presiding.

**OPENING STATEMENT OF HON. CHUCK GRASSLEY,  
A U.S. SENATOR FROM IOWA**

Senator GRASSLEY. I'm very happy to be in Dubuque today, and I extend my gratitude to the city of Dubuque and the Dubuque Regional Airport for giving us their hospitality this very day.

I'm always excited to highlight the great things that are happening in Iowa when it comes to energy. I would like to thank Rentech Energy Midwest Corporation for the tour of their facility in East Dubuque that was given to members of the Finance Committee staff and others yesterday. Rentech is in the process of converting their 830-ton per day fertilizer plant from a natural gas facility to a coal and biomass gasification facility which will allow them to produce alternative fuels, nitrogen fertilizers, and electricity. It's very important for many reasons. As our country becomes more dependent upon biofuels, we will become more dependent upon fertilizer that farmers use to grow their crops that produce the alternative fuel. Additionally, the fuel produced at this facility will be able to be used in any current engine that runs on conventional diesel fuel, as our witnesses will explain soon, and it could be used for any plane that flies on jet fuel.

Today's hearing is going to be building upon previous work of this committee in Washington, DC. Appearing earlier as a witness was Rentech Energy Midwest Corporation president John Diesch, who spoke in greater detail at that time about Rentech's alternative fuel goals during a Finance Committee subcommittee hearing in April this year, and I would put his testimony from that hearing in the record for this committee hearing.

[The statement appears in the appendix on p. 64.]

Senator GRASSLEY. In addition to focusing on the infrastructure required to produce alternative fuels, this hearing's other purpose is to draw attention to the unique issues faced by rural airports as

they work to provide service to people and businesses in this region and in their respective regions. Access to air transportation is a very important variable in the calculation of any State's economic growth, and particularly that would be true of Dubuque. Rural areas in particular tend to be underserved in this regard, and sometimes it makes me wonder if the people back in Washington realize that most of America is rural, and that is why I wanted to transplant a piece of official Washington to real America by holding a hearing in this hangar. And, I might add, the airport grounds surrounded by cornfields are for Iowans an obvious reminder of the alternative energy of the future.

We may be talking about rural issues, but also I want you to know that renewable fuels and reliable transportation are ultimately important for all Americans regardless of where we live. The Finance Committee is at a very important crossroads in decision-making, because within the next 2 months our committee will be responsible for the re-authorization of the Airport and Airway Trust Fund, the tax provisions of the farm bill, and alternative fuel provisions in the energy bill. The committee will have the chance to influence the future of aviation policy through this re-authorization, and much of that future will be discussed by our distinguished panelists today.

America needs energy security, and rural America is willing to take on that responsibility, as evidenced by all of the ethanol plants and biodiesel plants around the Midwest. It will be our crops that are grown in these fields and our businesses that invest in this technology of the next generation and have already made tremendous investments. The importance of these issues is matched by the quality of the panel that we have today. And I know that my chairman, Senator Max Baucus, as I should indicate, chairman of the Finance Committee, has great interest in these issues as well. He is unable to join us today, as many times I've been unable to join him as he's had hearings around the country to highlight important issues, but he does have a very strong written statement for the record that will be available. And we have Leighton Quon, whom I've had a chance to greet this morning and seen quite regularly on Capitol Hill. He is from the Finance Committee staff and is an associate of Senator Baucus. So, if you want to hear points of view from other members of the Finance Committee who can't be here, maybe Leighton will be able to help you with that.

[The prepared statement of Senator Baucus appears in the appendix.]

Senator GRASSLEY. First we are going to hear from Kevin Billings, Deputy Assistant Secretary of the Air Force for Environment, Safety, and Occupational Health. Mr. Billings will discuss the Air Force's commitment to alternative fuels and its current plans to fully certify all of its fleet—both ground and air—for alternative fuels to include synthetic jet fuel. Where others have talked, the Air Force has taken incredible action in working to develop a fleet that will be able to fly on alternative jet fuel and drive on renewable fuels. The leadership of the Air Force is helping to drive an entire movement toward the use of alternative jet fuel throughout aviation.

Next we hear from Mr. Carl Bauer, Director of the U.S. Energy Department's National Energy Technology Laboratory. Mr. Bauer will discuss the important work being done by his laboratory on coal and biomass gasification. If we're going to reduce reliance upon foreign sources of energy, we will need to utilize our domestic sources of fuel. One source of fuel that we have in great abundance is coal. Despite a reputation for being dirty and a source of pollution, the work being done by Mr. Bauer and others to combine biomass like Iowa switchgrass with coal in gasification technologies will help turn coal into a clean energy source for the future.

Then we will hear from an Iowan, Under Secretary for Rural Development, Thomas Dorr. He is a farmer from Marcus, IA, no longer involved in his farming operation because of his Federal responsibilities, but this is a person, let me assure you, who knows the issues that impact rural areas, the problems and how to solve them. Mr. Dorr will discuss infrastructure issues in producing and transporting alternative fuels, the infrastructure required of the industries that develop and produce alternative fuels, and USDA's rural development commitment to community facilities to complement that growth, and that includes airports and the industrial parks.

Mr. Bruce Heine of Magellan Midstream Partners will discuss issues involved in transporting alternative fuels. Magellan specializes in transportation, storage, and distribution of refined petroleum products, and distributes most of the fuel in this area. It will not matter how much alternative fuel we produce if we're not able to deliver it to consumers on the coasts, and Magellan continues to be a trail-blazer in the incorporation of renewable fuels into our national fuel delivery system.

And then we have Mr. Steven Accinelli, chairperson of the Dubuque Regional Airport Commission, as well as director of the aviation programs at the University of Dubuque. Mr. Accinelli will talk about the issues facing aviation in rural America and the continuing challenges to develop and enhance service in rural or underserved areas by building access to both commercial flight and general aviation. He has the unique responsibility for academic bachelor degrees and flight training of over 200 students at the university.

Our final witness is Dr. Bruce Holmes, director of aeronautics research for DayJet Corporation. Formerly NASA's chief strategist, Dr. Holmes is helping DayJet enact an innovative business plan that will hopefully bring jet service transportation options to almost anyone's front door. And in addition, Dr. Holmes is helping his company lead the way to sweeping changes planned for air traffic control with the implementation of NextGen technologies and their interest in helping the Nation's airspace to become cleaner with fuel-efficient fleets.

So I thank all of you, and I particularly thank you for the opportunity to introduce you as I have with maybe lengthy introductions that you know about but these Iowans don't know about. So I thank you for helping us with this very important issue. Rural America has the ability to reduce our dependence upon foreign sources of fuel, but we have to provide the necessary infrastructure while ensuring that businesses have transportation options in rural

areas. Anyone who is truly concerned about the environment or our reliance on foreign sources of fuel has to pay attention to these issues, as I know our witnesses have. And we're going to take you in the way that you were introduced, so just proceed. Make sure the microphone is close to you. Because of the rain overhead we have a lot of competition, and if I hit a fly don't let it bother you. Don't take it personally.

**STATEMENT OF KEVIN W. BILLINGS, DEPUTY ASSISTANT SECRETARY, ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH, U.S. AIR FORCE, WASHINGTON, DC**

Mr. BILLINGS. Thank you, Senator. The Air Force is engaged every single day in global operations, fighting the global war on terror, defending our homeland, providing strategic deterrence, and giving our Nation unparalleled global vigilance, reach, and power.

The Air Force global operations require a tremendous amount of energy. We consumed almost 2.6 billion gallons of aviation fuel last year at a cost of almost \$5.8 billion. The Air Force total energy bill exceeds \$7 billion when you include the energy to operate our bases and fuel for our ground vehicles.

The United States currently imports nearly 60 percent of its petroleum products, and that number is expected to rise to 68 percent by 2030.

The growing economies of China, India, and the rest of Asia will continue to put pressure on world-wide petroleum demand. This global energy environment has significant implications for the Air Force and is a primary driver behind the Air Force energy strategy—to reduce demand, increase supply, and change the culture within the Air Force, so that energy is a consideration in everything we do.

The Air Force has an aggressive facility energy conservation program that achieved an impressive 30-percent reduction in energy use over the past years. The Air Force is also the Federal Government's largest purchaser of "green power."

Nearly 8 percent of our diesel fuel is B20. Today, 59 of our Air Force bases are dispensing B20, and bases are dispensing E-85, with a 16th E-85 station coming on line this week at F.E. Warren Air Force Base in Wyoming.

Senator, I know you are most interested in the Air Force's plan to test, certify, and fly using a synthetic aviation fuel.

Air Force lore has it that one day Secretary Wynne was walking among rows of fighter jets and bombers when he heard a voice. That voice from the field of airplanes said, "If you certify them, they will come." Much like the legendary Ray Kinsella, Secretary Wynne believes that by doing something out of the ordinary, the Air Force can make good things happen.

The Air Force synthetic fuels initiative is a key part to our energy strategy. The Air Force is committed to certifying our entire fleet of aircraft to fly on a synthetic aviation fuel blend by early 2011. Our additional goal is to cost-effectively acquire one-half of our contiguous United States aviation fuel via a synthetic fuel blend utilizing domestic feedstocks and produced in the United States by 2016.

This year on August 8, Secretary Wynne and the team responsible for testing and certification of the fuel and aircraft signed a certification certificate fully authorizing the use of a synthetic fuel blend in the Air Force fleet of B-52s, which appears in the picture to our left. This was the first step toward achieving the Air Force's goal. More flight-testing and airworthiness certification of the fuel are required to meet the Air Force goal of certifying our entire fleet.

Next, the Air Force will begin testing the C-17 and the B-1 engine this fall. The C-17 was chosen because its high-bypass engines are derivatives of the engines that are currently used on the Boeing 757. In this respect, testing will coincide with the work being done by engine manufacturers with the commercial airline industry.

The B-1 engine tests will be conducted this November, and the work will focus on augmenters and afterburners that will be critical in determining how synthetic fuel will operate in supersonic aircraft.

We know we cannot accomplish our vision without the full support and cooperation of industry and, specifically with respect to aviation operations, without the support of the Federal Aviation Administration. We have partnered with the industry's Commercial Aviation Alternative Fuels Initiative called CAAFI throughout our planning and testing of our program.

We will continue to work with CAAFI, the engine manufacturers, the Air Transport Association, the Airports Council International, the Aerospace Industries Association, and the FAA. Our collective goal is to ensure that we build a road map for the early and successful adoption of synthetic fuels for the commercial aviation transportation sector.

The Air Force recognizes that there is an environmental challenge with carbon management and greenhouse gases associated with the production of synthetic fuels. The Air Force believes this challenge can and should be overcome with the new technology currently being designed and developed by the government today. In this light, the Air Force is committed to source its supply of domestically produced synthetic fuel from producers that substantially capture and reuse or reform the carbon that comes out of the process.

Senator, 1 day after the Air Force had certified its fleet, Secretary Wynne was once again walking through the rows of fighter jets and bombers when he met a developer of synthetic fuel. That developer asked Secretary Wynne, "Is this heaven?" And Secretary Wynne responded, "No, it's Iowa." Senator Grassley, the Air Force appreciates the opportunity, and I look forward to answering your questions.

Senator GRASSLEY. You're either a baseball fan or else you have done some history in this part of the State.

[The prepared statement of Mr. Billings appears in the appendix.]

Senator GRASSLEY. Mr. Bauer?

**STATEMENT OF CARL O. BAUER, DIRECTOR, NATIONAL ENERGY TECHNOLOGY LABORATORY, U.S. DEPARTMENT OF ENERGY, PITTSBURGH, PA**

Mr. BAUER. Thank you, Senator Grassley. I appreciate this opportunity to provide testimony to your committee on the Department of Energy's advanced clean coal technologies.

The economic prosperity of the United States over the past century has benefitted by the abundance of fossil fuels found in North America. In fact, in Iowa 77 percent of your electricity comes from coal. Fossil fuels are important to our energy security and global economic competitiveness. However, concerns over climate change and air pollution challenge our ability to take full advantage of these resources.

One potential technology that could support our energy objectives is coal biomass to liquids—or CBTL—a process that uses coal and biomass gasification, combined with technology, to produce a wide variety of liquid transportation fuel products, while incorporating technology to mitigate CO<sub>2</sub> emissions via carbon capture and storage.

If CBTL were to become a viable economic technology option, it would depend on technologies that DOE has focused on for many years. These include coal and biomass gasification, syngas-to-liquids, carbon capture and storage, and enhanced oil recovery.

Research published by Professor Robert Williams of Princeton, as well as recent analysis by NETL and the Air Force, which should be published this year, shows that the greenhouse gas emissions from coal biomass to liquid systems can be well below those associated with the use of conventional petroleum fuels.

NETL's preliminary analysis shows that a CBTL system using about 12 percent corn stover on an energy basis would limit life-cycle greenhouse gas emissions to a level approximately 22 percent below that of conventional petroleum refining—approximating the greenhouse gas emissions that EPA has estimated from corn-based ethanol, and yet they aren't in competition, because the Fischer-Tropsch is a diesel-oriented product and ethanol is either an additive or a replacement to gasoline. And the fact is, at 21 million barrels a day of oil used in this country, we need both sources. Our study has found that the CBTL plant cost could be competitive when crude oil prices are at or above \$60 per barrel. We're kind of there right now.

By adding an adequate proportion of biomass to the process, it is estimated that a life-cycle greenhouse gas emission rate of zero or even negative can be achieved. This potential alternative would represent a process that emits no net CO<sub>2</sub> into the atmosphere—and even considers the fuel emissions coming from the tailpipes of vehicles that use the product fuel.

CBTL facilities would provide an early stimulus to the agriculture industry to develop the infrastructure and biomass resources needed to provide cellulosic biomass for the production of liquid transportation fuels. This would also support future opportunities for cellulosic ethanol production.

CBTL facilities potentially offer a significantly less expensive route to large-scale CO<sub>2</sub> management via carbon capture and sequestration. Analysis indicates that the cost of implementing car-

bon management at a CBTL facility is approximately 70 percent less than corresponding implementation at an Integrated Gasification Combined Cycle (IGCC) electricity power generation facility.

The product fuel related to CBTL facilities, using the Fischer-Tropsch process, typically consists of a majority of distillate, diesel and jet fuels, and naphtha product. Fischer-Tropsch diesel and naphtha do not directly compete, as I mentioned. The Air Force has decided not to consider ethanol for military fuel applications and is looking toward CTL and CBTL as well as biodiesel liquids as potential solutions for environmentally friendly domestic production of jet fuel.

In conclusion, a CBTL industry within the U.S. can represent a significant near-term domestic source of liquid transportation fuels production, providing a crucial foundation for enhanced energy security.

Mr. Chairman, that concludes my remarks. I'd be happy to answer questions.

[The prepared statement of Mr. Bauer appears in the appendix.]  
Senator GRASSLEY. Secretary Dorr?

**STATEMENT OF HON. THOMAS C. DORR, UNDER SECRETARY FOR RURAL DEVELOPMENT, U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, DC**

Mr. DORR. Thank you, Senator Grassley. Pardon my voice; I have suddenly acquired a cold. I would say that back in our shop we had fly strips that got the flies. We didn't have to beat them. It's nice to be back on the plains and watch a thunderstorm roll in. I haven't seen that for a long time. So it's great to be out here, and thank you for inviting me.

It is a distinct pleasure to appear before you today to discuss some of the logistical issues relating to the build-out of renewable energy. I commend the Senate Finance Committee for its interest in this topic, and I would especially like to thank the Dubuque Regional Airport for facilitating this discussion, and as an Iowan I would like to thank you for the growing support for the renewable energy industry and all of the things you have done through the Senate Finance Committee. It's been extraordinary.

Renewable energy is an extraordinary opportunity both for the Nation as a whole and especially for rural America, because renewable energy is largely rural energy and rural in origin. People in Iowa and other corn belt States are aware of what's happening, but the broader picture is, frankly, in my view one of the biggest under-reported stories of this decade. Since 2000, installed wind capacity in the United States has quadrupled. We led the world in new capacity in 2005 and 2006, and it appears we're on track to do that again in 2007. Ethanol production has tripled. Capacity will double again in the next 2 years. Biodiesel production has risen from 2 million gallons in 2000 to a projected 379 million gallons this year, rising to an anticipated 680 to 700 million gallons in 2010, 2011. Cellulosic ethanol is moving from the labs into production, and is a major priority for the president in the 2010 initiative as well as in the 2007 farm bill proposals. And even solar power, which is still relatively expensive, is increasingly competitive for off-grid applications, and the market is growing rapidly.

And finally, an interesting anecdote that pertains particularly to agriculture, 2006 was the first year in which we imported more crude oil in dollar value than the entire gross domestic agricultural production. We imported \$313 billion of crude oil or crude oil equivalents, and our gross domestic agricultural gas production was \$2 billion. No matter how you view it, this is dramatic progress, and it also represents a huge rural opportunity, but it's important to remember that we have just begun.

Renewable energy is building out from a very low base. As these growth curves are sustained, logistical considerations will become increasingly important. We're building out not one, but several new industries in rural America, and we will have to build the infrastructure to support them. For distributed power generation, we're going to have to expand the grid and develop transmission corridors to move large-scale wind power to urban markets. For biofuels, we will need to develop a new gathering, storage, and distribution system that moves geographically disbursed fuels from the heartland to the coasts, essentially a reversal of the existing largely import-oriented petrochemical stream.

The change will likely be qualitative as well as quantitative. The President's target of a 35 billion gallon alternative fuel standard envisions roughly a 7-fold increase over current production levels. Ethanol and biodiesel today are moved by rail and truck and barge. These industries will have to develop increased capacity to handle the build-out of biofuels. In addition, as the industry grows and its technical obstacles are overcome, pipelines will undoubtedly assume a larger role. These developments will impose challenges all around by Federal, State and local authorities as well as private companies. And I hasten to add, these challenges are business opportunities as well.

USDA Rural Development is an investment bank for rural America. We have a portfolio of more than \$98 billion invested in housing infrastructure, community facilities, business, and energy development projects. Renewable energy is a high priority in a growing part of our portfolio. We are in discussion with the rural electric utilities about the need to modernize the grid. From fiscal year 2001 to 2006 we have invested more than \$480 million in more than 1,100 renewable energy and energy-efficiency projects ranging from biofuels and biomass to wind and solar to geothermal and methane gas recovery. With regard to logistics, while rural development does not finance highways, our community facilities programs are prepared to assist public authorities with key transportation investments such as rail spurs and airport improvements.

In closing, we recognize that renewable energy has become a major driver of the rural economy. Indeed, it may be the greatest new opportunity for investment, jobs, and wealth creation in rural America in our lifetimes. We at Rural Development are committed, as I know you are as well, to supporting rural communities, businesses, and entrepreneurs in seizing this opportunity, and we look forward to working with you in that effort. Thank you, and I'll look forward to taking questions later.

Senator GRASSLEY. Thank you very much.

[The prepared statement of Mr. Dorr appears in the appendix.]

Senator GRASSLEY. Proceed, Mr. Heine.

**STATEMENT OF BRUCE W. HEINE, DIRECTOR, GOVERNMENT  
AND MEDIA AFFAIRS, MAGELLEN MIDSTREAM PARTNERS,  
TULSA, OK**

Mr. HEINE. Thank you, Senator Grassley, members of your staff and Finance Committee, others in Dubuque. Thanks for inviting Magellan to come speak with you today. We own 81 petroleum distribution terminals throughout 22 States and the Nation's longest refined products pipeline system. It spreads throughout the great State of Iowa, including a distribution terminal here in Dubuque, one in Des Moines, another in Fort Dodge, Iowa City, Sioux City, Milford, Mason City, and Waterloo. As the refined products and as the demand for biofuels continue to grow, that does mean more opportunities for our Nation's pipeline system to expand to accommodate that growth. Our company looks at opportunities, not only domestically, but on the shores of the United States as well. As more products continue to flow into the shores, pipeline capacity is necessary to expand the distribution capability to those in States that don't have refineries. And, as mentioned by my colleagues on this panel and by the Senator, at some point pipelines may become a productive and efficient way to move our Nation's biofuels from the point of origin where they're produced to the markets where they're consumed.

My remarks today focus on two areas. One would be moving ethanol and transporting ethanol and biodiesel in a pipeline system, and, second, reviewing our experience in handling Ultra-low Sulfur Diesel fuel, and a few comments as it relates to synthetic jet fuels as they evolve in coming to the market and our view in potentially putting those types of new fuels into our pipeline system for distribution.

Today we do not ship ethanol in our pipeline system. Our system handles a variety of grades of gasoline, of diesel fuel, and jet fuel. There are a few technical issues that have to be overcome, as Secretary Dorr mentioned without specificity. However, from our perspective there are a few technical issues that have to be overcome before we see the commercial transportation of ethanol or an ethanol-blended fuel in a pipeline system. The most significant challenge that we have before us today is the phenomenon known as stress corrosion cracking. And stress corrosion cracking is simply having a product inside of a pipeline which is under pressure that can create a crack in the system. And it can occur in either a tank or it can occur in the pipeline system itself.

For years Magellan didn't have any experience with this phenomenon, and we have been handling ethanol in our distribution system at our terminals since 1980, and Iowa was the first State where we invested in distribution infrastructure. This problem, however, of stress corrosion cracking must be resolved, and the reason that it must be resolved is that the pipelines and pipeline companies like ours put a tremendous priority on keeping products from leaking into the environment to protect communities where these pipelines run. So we know that there's an issue. There's a technical issue that we don't completely understand that's causing a higher level of cracking with ethanol than other refined products that we move through the system.

The Association of Oil Pipelines, which is our Nation's trade association representing the Nation's pipeline companies, is studying the potential of putting ethanol blends in pipeline systems in the short-term. We think that there may be some commercial opportunities to transport 90 percent gasoline and 10 percent ethanol in our pipeline system.

Now, there are a number of commercial benefits to successfully implementing that program. For our terminals in Iowa and elsewhere in the country where we have ethanol blending, it's expensive to install the systems at the terminals. We have additional tanks, we have lines and blending systems at those terminals which often results in millions of dollars of expenses. By being able to transport an ethanol blend into the terminal from a refinery or other pipeline origin we would potentially eliminate the need for added infrastructure at the terminal, and that is even more important when you look at large companies that could be fed by rail. So, if you're able to successfully bring the blend in by pipe, you would eliminate the need for rail off-loading infrastructure.

So there are a number of benefits to being able to successfully overcome this barrier, this technical barrier known as stress corrosion cracking. And as I mentioned, our trade association is studying the cause and the potential solution for dealing with stress corrosion cracking, but as a company we believe that it's conceivable that there would be limited opportunities to transport 10-percent ethanol blends and that that may be technically feasible because of the low concentration of ethanol in the product. Stress corrosion cracking has to be resolved as well to look at dedicated ethanol pipelines. And, as we see more and more ethanol produced here in the State of Iowa and elsewhere in the Midwest, the possibility and the economics make more and more sense as that production base continues to grow. Let me give you an example. We have pipeline systems today that carry 100,000 barrels a day of product and many carry much more than that, but to base-load a 100,000 barrel a day pipeline you would need dozens of average-size ethanol plants to fill that pipe to go either to the east or the west coast.

So there are indeed aggregation opportunities that Secretary Dorr mentioned, but there are also challenges that go along with that, and the biggest challenge again that we have before us today as the pipeline industry is the challenge of resolving the technical issues. If we can't resolve the technical issues, we can't get to second base to look at how we would aggregate product from dozens of ethanol plants to base-load a pipeline system to make economic sense to transport it 1,000 miles to the east coast. A project of that magnitude is probably a billion dollars, if not more. So there are opportunities before us, and we're a company that's motivated to find answers to these questions.

Let me turn to Ultra-low Sulfur Diesel as it relates to synthetic diesel fuel and synthetic jet fuel in the future. And our belief is that we change fuels based on what our shippers want us to carry into the system. So shippers in Magellan's pipeline system are refiners and gasoline marketers and others that take positions of ownership in fuels that we transport. Magellan itself doesn't own the gasoline or diesel in our system, so it's owned by others. So, if a shipper came to us and said, "We want you to transport a jet

fuel, a new alternative grade of jet fuel,” we look at a number of different factors. We look to see if there are compatibility issues. We look at the volumes, we look at the origin and where we would pick it up and then the destination of where we would deliver it to market for the end use. In the case of synthetic jet fuel, we would look at, do we have an opportunity to blend the fuel into Ultra-low Sulfur Diesel or jet fuel at the origin or do we need to segregate it by itself from the origin to a destination. So there are a number of commercial issues that need to be reviewed and resolved prior to the transportation of alternative or synthetic jet fuel in the pipeline system. However, technically a new source of diesel and jet doesn't cause the same type of issues that I explained earlier with ethanol. So from a compatibility issue we believe that the transition would be much easier to make.

Now, we have a new grade of diesel fuel that we're transporting in our pipeline system today. It's called Ultra-low Sulfur Diesel. And, if you have a diesel vehicle, you're purchasing it today at the pump. For a pipeline company, it created quite a bit of a challenge to be able to keep that product and keep its integrity intact. And part of the reason is we have other fuels in the pipeline system that have very high levels of sulfur, and jet fuel is one of those products. Jet in our system today can contain as high as 2,000 parts per million. Yet we're trying to segregate and keep the Ultra-low Sulfur Diesel at 15 parts per million or less at the terminal. We have been very successful, but success comes with challenges in how we manage our system and it would come with challenges if we have a new product that's introduced into the system as well, such as synthetic diesel fuel or synthetic jet.

Generally for a pipeline company, the fewer the products, the better. The more fungibility we have and the larger volumes of individual products the better, the better we are able to secure the supply at certain areas and the lower our costs are for transporting these products because we wouldn't need additional storage as we may need for a new product.

So there are a number of different issues pipeline companies will look at in regard to the evolution of new fuels, and the evolution of the newest fuel for us right now is the prospect of putting an ethanol blend in the pipe, and that's why we're so focused on getting answers from our trade association and studies that we're doing there collectively as an industry, and we're hopeful that the Senate energy bill which contains a provision to provide funding for the Department of Energy to study the technical, economic, and regulatory issues associated with the construction of the dedicated ethanol pipeline system will pass. We hope that that becomes law, Senator, because we think that's a good idea to have that additional helping hand to study those various aspects.

So in summary, thanks again for the opportunity to be here today, and I look forward to any questions you may have.

Senator GRASSLEY. Thank you.

[The prepared statement of Mr. Heine appears in the appendix.]  
Senator GRASSLEY. Mr. Accinelli?

**STATEMENT OF STEVEN R. ACCINELLI, CHAIRPERSON, DUBUQUE REGIONAL AIRPORT COMMISSION; AND DIRECTOR, AVIATION PROGRAMS, UNIVERSITY OF DUBUQUE, DUBUQUE, IA**

Mr. ACCINELLI. Good morning. I'm pleased to be here representing the greater Dubuque community. Certainly I'm a transition speaker from the other panelists here. But air service, both commercial and general aviation in my opinion, is the single most essential component in our new global economy. This is true for Dubuque, IA as well as for Chicago or New York.

Let me introduce you to Dubuque. Our economy has defied the odds over the past 10 years. Progressive attitudes, capital investment, public-private cooperation, and careful planning have been the ingredients for success. *Moody's/Economy.com* noted that Dubuque's employment growth remains robust at triple the State and national paces. This respected firm added that Dubuque has historically defied expectations as development has staved off recessionary conditions. *Forbes* magazine places Dubuque in the top 15 on its U.S. list of best places for business.

We transition now to aviation commercial infrastructure. Aviation infrastructure is critical for growing communities. Airports traditionally have been good economic engines when properly managed and supported. Major corporations that seek to establish a presence in a community need a robust transportation infrastructure. An airport with commercial service and facilities for business, charter, medical, and government air services is simply a necessity for a community to succeed today in the global marketplace.

In 2000 the Dubuque Regional Airport had 59,000 enplanements served by three air carriers. Today only American Eagle serves the airport with four daily flights to Chicago. In 2003 through the combination of a Small Community Air Service Grant of \$610,000 and an organized, unified, well-funded marketing campaign led by the local chamber of commerce, "Fly DBQ" was launched to increase frequency and passenger load, a "use it or lose it" proposition. That campaign was successful. It preserved the fourth flight from American Eagle, and that fourth flight today continues to operate.

Getting additional air service has been to date nearly impossible to attain. Airlines continue to operate on very small margins and require strong incentives to take the risk of moving into a new community or re-establishing itself in former communities. They continue to look for every operational advantage and revenue guarantees. In order for Dubuque to gain more frequency or gain access to additional hubs, air carriers are forced to sacrifice service to other communities. There are a multitude of factors which determine "who gets what." If it was purely actuarial crunching, little or no services would be provided to our key rural regions of our country.

One air carrier with four departures per day simply is not enough to entice easy access to and from other locales. Further, the ridership on our four flights is averaging in excess of 74 percent full. Limited capabilities make it difficult and costly to attain remaining seats, and it precludes additional tourism travel. If Dubuque is to grow, we need more access.

General Aviation. Rural and underserved communities require strong commitments from its general aviation activities to continue business growth and global reach. Medical flights today are even more important to underserved communities. Here in Dubuque we have seen an increase in business aircraft, charter flights, and owner-operated aircraft to sustain viable growth. Transient aircraft as well as jet fuel purchases indicate an active market, while fuel sales continue to decline from our air carrier, American Eagle. Dubuque is limited by its ability to grow. Its support of business aviation with its lack of hangar, ramp, and available office space is a major concern. Enticing a quality charter operator or any other aviation business to move to Dubuque is difficult. We must not forget that general aviation has become key to sustained growth of a community, yet funding for adequate infrastructure lags commercial air service funds. Rural and underserved communities may need funding in a different and non-traditional manner.

University Flight Programs. Currently, university flight programs provide our Nation with the majority of qualified pilots being hired by the regional airlines today. Demands for qualified pilots are the highest I have seen since 2000. The level of hiring of pilots by U.S. airlines and international operators is forecast to remain robust, and the majority of hires will come from university flight programs until at least 2017, according to a recent article by *Aviation Weekly and Space Technology*.

The University of Dubuque is a not-for-profit private institution of higher education conducting flight training from its base here at the Dubuque Regional Airport. The University of Dubuque's aviation programs have over 210 students, with 23 multi- and single-engine aircraft and a staff of 35. We're the only bachelors degree institution in Iowa offering professional aeronautics and aviation management in the State. The University of Dubuque has a nationally recognized program based on its high standards, as recognized by the Aviation Accreditation Board International, its high job placement rate, and its arrangements with key employers like American Eagle for which the University has a preferred hire program.

I remain very concerned about the cost our students must incur to become professional pilots and the access to the aviation infrastructure necessary to train the world's safest pilot workforce. Reasonable fuel prices and access to energy alternatives for aviation fuels are critical needs. The U.S. is the leader in aviation training. We need to protect this capability and maintain our leadership and opportunities for our pilot workforce.

Allow me one more transition, to contract Air Traffic Control towers, which remain essential to ensure safety and support for growing and emerging high-performance communities. Today the Dubuque Regional Airport is fast approaching the second busiest airport, based on flight operations, in the State of Iowa. The fielding of Next Generation and other key ATC technologies will only enhance the safety in Dubuque and other locations.

An example is an incident with a University of Dubuque student who became disoriented with low clouds, was helped by technology in an American Eagle aircraft on the ground because the tower did not have that same level of technology. Had the aircraft not been

assisted by the technology on the American Eagle aircraft, the outcome could have been quite different.

As communities change and grow, it appears that only contract towers provide the flexibility to assist communities to provide safe air traffic management on relatively short notice to abate air traffic issues.

In conclusion, the city of Dubuque and the Airport Commission have been proactive in attempting to secure the best value for its citizens and in surrounding communities. Support to rural and underserved communities' aviation infrastructure is critical for market access, employment, growth, safety, and quality of life issues. Funding is necessary to preserving Iowa's communities. And I'd like to thank Senator Grassley for giving Dubuque an opportunity to share its story.

Senator GRASSLEY. Thank you.

[The prepared statement of Mr. Accinelli appears in the appendix.]

Senator GRASSLEY. Dr. Holmes?

**STATEMENT OF DR. BRUCE J. HOLMES, DIRECTOR, AERONAUTICS RESEARCH, DAYJET CORPORATION, BOCA RATON, FL**

Dr. HOLMES. Thank you. I'm going to put a picture of our new baby up here for everybody to see. Thank you so much, Senator, for inviting us to be part of what we consider to be an essential approach to viewing the challenges from the system perspectives of transportation, sustainable energy, and economic development. We think that this is somewhat of a unique gathering of thought leaders on those subject areas, and it's vital for us to look at some of the solutions that we face in that system perspective. I appreciate the opportunity to testify today on the work that DayJet is doing with the Federal Aviation Administration, the Joint Planning and Development Office, the National Aeronautics and Space Administration, the Transportation Security Agency, and Eclipse Aviation in developing the world's first "per seat, on demand" regional air transportation service between underserved communities also using under-utilized small community and regional airports as well as using under-utilized air space.

As you know, such communities as Dubuque stand to be the biggest beneficiaries of the revolutionary concepts that are coming in the 21st century in air travel, such as ours. We would like to share with you today our business model, our plans to accelerate the implementation of NextGen aviation and air space technologies, and our commitment to work with our suppliers to reduce our footprint in all of its dimensions—energy, carbon, noise, cost of expanding the Nation's air space capacity—and ultimately affect the beneficiaries in terms of our customers' time and the community economic development opportunities that result from this transportation revolution.

First, a few words about our business model. Our corporate mission is quite simple. We want to make safe, affordable, secure, direct on-demand jet transportation possible between secondary markets in this decade. In addition to restoring productivity and quality of life for business professionals in the communities we will

serve, our air transportation service will expand local economic development opportunities wherever we fly.

Let me make a point here that relates to some of the challenges we face in establishing and growing this market opportunity, this innovation really in this new space. We are not a scheduled airline. We're also not general aviation. So one of the challenges we face in working with our partners in the Federal Aviation Administration, for example, is achieving an understanding of what we are. We are an operator of aircraft providing a commercial service that reaches into markets that are not reachable with schedules, and so it's a rather different piece and it does present an educational opportunity with the folks in the Federal sector. And they're receiving the message quite well, and we want that to continue.

DayJet will connect smaller communities, metropolitan exurbs, and rural areas with a point-to-point service. With missions in the range of 100 to 600 statute miles, our short flights will avoid entering Class B air space. We don't need and don't want to use the OEP 35 airports, for example, the big airports that handle about 90 percent of the scheduled air-carried passengers in America. Instead we will fly in under-utilized air space at flight levels typically between 18,000 and 26,000 feet—out of the jet routes. DayJet plans to fly our initial fleet of more than 700 Eclipse 500 jets, such as the one you see in this illustration, using a two-person crew, meaning we will train and fly pilots, we'll train our flight crews in a program that is very similar to that of traditional airlines. And as an FAA FAR 135 certificated on-demand operator, we choose to train our pilots and maintenance personnel at the level that goes beyond the minimum requirements in the regulations. We do the same when it comes to security.

Our value proposition for travelers is in gaining personal command of time. You're no longer only limited to the schedule that is published by the scheduled carriers, if in fact there is even a service to the place that you might want to leave from or arrive at. It means our customers have greater freedom of choice in where they live, work, learn, and play. Our value proposition for communities is in expanding economic opportunities beyond the confines of the hub-and-spoke airline system or the on and off ramps of the interstate highways. This means that rural communities can participate more fully in the Nation's expanding economy and in strengthening their economic position through regional collaboration without being victims of geographic isolation.

Finally, our value proposition for the Nation's air space system is in expanding air space capacity while mitigating our environmental footprint through technologies as envisioned in the Joint Planning and Development Office's Concept of Operations for the NextGen capabilities. A more complete description of the DayJet "per seat, on-demand" model is attached in our written testimony.

Let me say a few words about the NextGen. Our investments in NextGen technologies are a driving factor we believe in accelerating the modernization of the Nation's National Air Space System. FAA estimates in less than 20 years air traffic will more than double, passengers will more than triple. However, simply tripling the old infrastructure from the 20th century is neither a scalable or affordable solution. The existing architecture is built around so-

lutions that came from the middle of the last century, including radars and VHF analog voice communications, for example. Therefore, we need to transform and modernize this system rather than expand the status quo. I think by and large all of the key players are on board with this concept. Working in partnership with the FAA and leveraging technological research and development by NASA, we have identified some key areas in which we believe best practices in operations, advanced practices in flight operations in the air space, combined with new technology can be implemented affordably. The instrumentation we plan in our aircraft and our training we believe will maximize safety and operational availability of our fleets while minimizing the workload that we would impose on the air traffic control system of the 21st century. Our investments are in on-board technology. So we have taken what used to be on the ground and we put it in the aircraft, and now what was on the ground in the 20th century is now in space in satellite navigation communication capabilities and works in a fashion that utilizes those assets. And the price of those assets, I need to point out, is declining at the rate of what we call in the technology community Moore's Law, the falling price coupled with the soaring abundance of computing power.

So we have learned a lot of new acronyms. I have FT for Fischer-Tropsch, CTL, GTL, CBTL, so I need to add a few to our lexicon. It is a little bit like a new foreign language for all of us. DayJet will use new Required Navigation Performance or RNP capabilities for our routes between our communities and a wide area augmentation system for improving the lateral precision vertical guidance, or LPV, approaches that we fly into the airports that used to have to require a very expensive Instrument Landing System in order to have near all-weather capability. That will be a thing of the past.

We believe that it's possible for us in our network of airports in the southeast six States where we launch here imminently, to have 300 airports with say 100 aircraft in operation at first by this time next year, operating to any runway anywhere in those 300 airports as though it did have an ILS, but it won't, as though it did have radar, but it's not needed, as though they did have control towers, but they're not required. You begin to get a sense of the advancements that are possible in both performance and safety and cost in this 21st-century system.

We will equip our fleet with Automatic Dependent Surveillance Broadcast, also known as ADS-B transponders. They're little radios that digitally communicate back and forth, allowing much improved capabilities for surveillance both on the ground and air-to-air. This is truly a revolution. We believe that it's necessary as what's called "ADS-B-in" technology becomes available, meaning the aircraft can now have a signal coming into the aircraft of other aircraft position information. We expect to reap the benefits of reduced spacing in the air space for aircraft to safely operate around airports that again may not have radar and be able to stay apart in near all-weather conditions.

These technologies also greatly improve situational awareness both on the ground and in the air for knowledge of traffic. The innovations result in lower costs for all parties while enhancing safe-

ty through greater precision, thus the Required Navigation Performance acronym, utilizing more air space by more aircraft to more airports. These advancements will benefit travelers, industry, government, and the communities served by rural airports.

Attached to our testimony is a white paper that outlines the concept for a partnership in the industry led by industry for accelerating the early adoption of NextGen capabilities. We're in the process of sharing that paper with our partners in the Federal Aviation Administration and shortly with the Joint Planning and Development Office.

Finally, let me close with a few thoughts about alternative fuels. We believe that the NextGen system is a key enabler of the greening of air transportation. As one of the major buyers of aircraft engines, DayJet is working with our suppliers to continue to reduce the energy, carbon, and noise footprint from our operations. As our new industry begins to grow, we look forward to working with our peers and exploring and ultimately implementing changes that affect our entire industry footprint.

As we describe in our NextGen Demonstration plans attached to the testimony, we believe that these new ways of adding capacity to the Nation's air space can be green in nature; that is, we think we can demonstrate and document the improvements that are possible in the footprint. We're developing strategies for use of our aircraft in testing alternative fuels. Within a very short number of years many of our aircraft will be retiring from our fleet, but they will have many hours remaining of useful life and they can be used for alternative fuel testing, and we're exploring those options.

We believe that our opportunity in front of us is to have a footprint in energy, in carbon, in noise, in the cost of expanding the Nation's air space capacity, and the economic opportunity it represents to the Nation as a win-win-win deal for travelers, for industry, and for the Nation's community. I'm glad to answer any questions.

[The prepared statement of Dr. Holmes appears in the appendix.]

Senator GRASSLEY. I thank all of you for your testimony, and particularly some of you who had to come out of your way to be here. I appreciate it very much. I'm going to ask questions of one individual at a time, but if any of you, without my calling on you, have something to add to that person's answer to my question, jump in before I ask the next question, and I'll be glad to have that as part of the testimony.

I'm going to start with Secretary Billings. The Air Force has stated in various press announcements that it's focused on liquid—or coal to liquids. Is this the only feedstock for this fuel that the Air Force is researching and testing?

Mr. BILLINGS. Senator, thank you. No, it's not, but coal is the largest and most abundant energy source we have in the United States, and, as I mentioned earlier, the precarious nature of foreign fuels drives us to want to have domestic feedstocks and abundant domestic sources, but we are looking at and testing a variety of feedstocks being used in the Fischer-Tropsch process. We're working with the folks at the National Energy Technology Lab to do that. We're also building a Fischer-Tropsch test facility at the Air Force research laboratory at Wright-Patterson Air Force Base to

look at how CO<sub>2</sub> emissions can be affected by switchgrass, corn stover, rape seed, and algae as well. Also we received for testing an issue of synthetic jet fuel that's been derived from animal fat. So the Air Force is looking at all sorts of feedstocks.

What we want to do with our testing certification is to develop a performance standard for the synthetic fuels so that the synthetic fuel that we use can come from any feedstock as long as it meets the performance requirements and we can move forward with that, but our goal is domestically produced and domestically grown and derived energy to reduce our demand on foreign fuels.

Senator GRASSLEY. You said in your testimony how you're working with commercial airlines. Has the commercial airline fleet made the same commitment to acquisition of synthetic fuels as the Air Force has done, which I understand is 50 percent of blended jet fuel by 2016 or 400 million gallons of synthetic fuel?

Mr. BILLINGS. Senator, the commercial aviation industry has been very supportive of what we have been doing, and they have also committed to certify their fleet by 2008 working on a 50-50 blend, and their goal is to certify 100-percent synthetic fuel by 2010. However, the primary driver within the commercial aviation industry is going to continue to be price and competitiveness, and so that is going to be the real key as to whether or not the commercial industry will begin to buy this. The Air Force has made a commitment to drive that market, and we have the ability to do that, and we feel it's the responsibility as the leaders to move forward in that. So hopefully, the certification of the Air Force engines along with the the certification of the commercial engines and the commitment of the Air Force will make sure that there are enough people out there to produce synthetic fuels so that the commercial industry will also follow suit.

Senator GRASSLEY. You mentioned the increased acquisition of low-speed vehicles and E-85 vehicles by the Air Force. You seem to say that the construction of E-85 fueling stations has not kept pace. Is there anything that Congress can do to ensure the proper balance of E-85 or B20 vehicles and stations on Air Force bases?

Mr. BILLINGS. Well, Senator, we're looking to do as much as we can in this area. We're working in the State of California with the Governor's office to expand our land use to leases where we allow commercial entities to take pieces of land the Air Force needs but are under-utilized, and one of the things we're beginning to look at at our bases is to find space at the corner of bases near or at the gate that we could lease to a private entity who could, between the E-85 vehicles that are available within the Air Force within the gate that we use as well as the commercial market, be able to have a flow of enough vehicles so that it would be commercially viable for them to put an E-85 station there.

The other thing we're looking to do is to make sure that the places where we do have E-85, that 100 percent of our vehicles are there. So one of the things we're looking to do is, because we have a requirement to purchase 75 percent of our fleet as E-85 vehicles, to put 100 percent of our fleet in places where there is E-85 and move the vehicles that aren't going to be using flex fuel to places where it isn't available. Right now I'm not sure that there is anything that Congress needs to do. We're working inside the Air

Force to move that forward, and again it's a matter of figuring out how to make it commercially viable to work with the public/private partnerships and with the communities to see if we can find space on our bases that is close to the edge so that we can move forward and go that way.

Senator GRASSLEY. Mr. Bauer, am I to understand from your testimony that, by gasifying the appropriate combination of coal and biomass, capturing the resultant CO<sub>2</sub> and sequestering it, that the liquid fuel is actually better than carbon-neutral?

Mr. BAUER. That's correct, Senator. Our studies, the study at Princeton by Professor Williams and actually the experience in the Netherlands, all demonstrate that we can do the gasification of the coal and biomass together. Our calculations are, if we took all the CO<sub>2</sub>, captured it, and put it in sequestration in the ground, that we would not only avoid the release of any CO<sub>2</sub> from coal, but we would also remove from the inventory of the atmosphere the plant CO<sub>2</sub> associated with the biomass and, therefore, the whole process would be CO<sub>2</sub>-negative even to the point that, if enough is used, somewhere around 20 to 30 percent of switchgrass could very probably offset the use of the fuel by combustion engines so that you would not only be CO<sub>2</sub> system-neutral for the generation of the fuel, but actually for its use as well.

Senator GRASSLEY. Let me tell you something I'm concerned about, and that's the requirement for the 75-percent capture and sequestration of CO<sub>2</sub> from IGCC and gasification produced syngas and related chemical products greatly handicapping the timely implementation of this industry. Recognizing the importance of fertilizer to corn production, if this is true, would it severely handicap the domestic production of fertilizer and have a significant negative impact on both the agriculture and biofuels industries?

Mr. BAUER. I'm familiar with that portion of the bill, and the problem is, while we can use technology today to actually capture CO<sub>2</sub>, although it would be quite expensive at that quantity, the ability to put it in sequestration in the ground is really not there yet. We have quite a bit more technical work. We have large-scale demonstrations, and evaluation will be done over the next 5 to 10 years, and then with the regulatory framework, which also does not exist, industry could make reasonable business decisions to make the investment and see that they could regain their investment.

So it would be very hard for me to foresee within the next 10 to 15 years the sufficient business certainty to make those kind of decisioned investments to be there for any substantial portion of the industry to take advantage of that tax credit at the 75-percent capture and sequestration. That's not including enhanced recovery use of CO<sub>2</sub>, which is not considered sequestration. Obviously that could be done, and that would be a very ready first fruit, hanging fruit to be captured by the industry and make it more economically viable.

Senator GRASSLEY. Let me suggest to you and anybody in the audience that this is something that's going to take a tremendous education of Congress and overcoming strong interest groups in Washington that don't want anything done with coal whatsoever. They just want to forget that it exists as a source. And this 75-percent figure that seems to be out there, I know people on our

committee who feel strongly about it, but there are a lot of others who see a high figure of 75 percent, and for some people that's not high enough, as there is an effort to just stop coal, all of this coal to liquid technology that's moving forward.

Also for you, Mr. Bauer, could you further explain, and this is a chart we're talking about, isn't it? Could you further explain the graph comparing the fuel for gasification technology that's been released by the National Energy Technology Lab? It's a chart that describes gasification or gasifying switchgrass.

Mr. BAUER. What this chart does—and we have been working with EPA and with the Air Force, and the new report will have more details and more lines—basically, if you look at the right side of this chart, the dark color, the color would be black, but that's if you just used coal to liquids without any captured CO<sub>2</sub>. Obviously you have substantially more CO<sub>2</sub> released than the normal refinery process. The zero is what a typical refinery as a baseline releases. So when we zero it at a typical—and by the way, I might also suggest that that zero line is about domestic refining of domestically produced oil. A large quantity of our oil is imported, so you really have to raise that zero a lot higher when you figure the cost of transferring the fuel and the CO<sub>2</sub> released by the ships moving it all. But for our refineries on domestic crude, what we use is zero.

If you look at the left side of the page, time is short I know, that is coal biomass combined with capture and sequestration with a switchgrass content of 38 percent, which could be a little higher, but it gives you the idea that it would be 100-percent less than the present refinery releases, which would therefore more than offset the use of the fuel in the private sector vehicle and with industry and the Air Force. So an in-between or different amount of switchgrass combined with the coal—you can kind of pick how much switchgrass you have and the economics and the difficulties of dealing with the part of how to decide which one to use—but those are all very viable possibilities, technically speaking, and they show that you can do this with CO<sub>2</sub> capture and sequestration and offset the CO<sub>2</sub>, not just for the production of fuel, but also for its use as well.

Senator GRASSLEY. Well, thank you. Secretary Dorr, you know, a lot of times—my staff just informs me, Mr. Bauer, that you have to leave us pretty soon because you're on a 12:30 American Eagle flight. I want to tell you, thank you very much for coming, so, if you have to leave, I understand.

Mr. BAUER. Thank you very much, Senator. I appreciate being here. I think I'll get out of the way and just go over to the side, so I can just run over to the other side here. Thank you.

Senator GRASSLEY. Thank you. Secretary Dorr, I've heard you many times, and so I want to ask you something just to expand on something you frequently said, that renewable energy may be the greatest wealth creation opportunity for rural America in our lifetime. In regard to this, are you talking about all renewable energy or just certain kinds of renewable energy?

Mr. DORR. No, I think, to a large extent, all of these renewable energy initiatives have been made possible as a result of what I call or frequently term "distributed computing." Essentially, because of broadband connectivity and the development through

Moore's Law and a number of other initiatives, it's now possible on a distributed basis to put up a relatively small refinery, 100 million gallons or less as opposed to a large fossil fuel refinery on the Gulf Coast, or to operate and integrate a small wind farm or manage a geothermal facility. Any of these, which are all largely rural in origin, are now competitive to a large extent in ways they have never been before, also driven by the fact that we have \$50 to \$75 a barrel oil.

The question is, do we have the investment, do we have the business or the security models, and do we have the regulatory regimens that will allow these rural communities the opportunity to make sure that not just the farmers or the tenants, but the barbers, the school superintendents, the local banker, the bus drivers, all have a chance to invest in these in a way that allows you to capture a great deal of that growth? And I want to make it clear that I'm not suggesting restricting the flow of equity, but I've referred to this story many times, and it was 2 years ago at the Renewable Energy Finance Forum in New York city. A gentleman got up and said, "This is our second annual. Last year there were 370 people here. This year there are 570, and you represent \$125 billion of equity that's interested in investing in renewable energy." Later a venture capitalist got up and indicated that he had for the first time raised \$85 million, Tier 2 risk at Wall Street for the investment into an ethanol facility. Later I went up to him and asked him if it was the facility I thought it was, and he said, "Yes." And I said, "What's the likelihood that that money came from the Middle East or the Persian Gulf?" and he said, "All of it did."

So my point is that, as the technology has matured and we are now able to do these things, I think it's equally important that we look at the investment, the security, and the regulatory regimens that will need to be addressed to make it possible for the local citizens to have an opportunity to invest in these opportunities so that in the final analysis you keep the wealth aggregation in local communities as opposed to shipping it out to somewhere else.

Senator GRASSLEY. Could you explain further your reference to the \$313 billion of imported foreign crude oil versus \$242 billion of gross domestic agricultural production? Could renewable fuel made from agriculture, from our products, reduce our billions of dollars of imported crude?

Mr. DORR. Certainly, and it's a pretty basic number. Last year in '06, for the first time, the value of imported energy, crude oil, exceeded the cash value of our entire gross domestic agricultural production, \$313 billion of imported crude oil, \$245 billion approximately of cash value agricultural production, everything from specialty crops, to flowers to meat, poultry, dairy products.

To put it into perspective, if we could displace just 1 billion barrels of imported crude oil, today's value would be something in the neighborhood of \$65 billion. That is greater than the rolling 10-year average of net farm income, which is approximately \$58 billion, and again I'd point out that all of this is largely rural in origin and could be developed—distributed and controlled and managed to be distributed—through computer systems, a lot of process technology and capital and market access. So it's just a way of framing this so that we can get—quite frankly, one of the big impediments

to rolling this out is our traditional rural lenders. Traditional rural lenders have historically depended on the Federal Government to be the lender.

In the final analysis, and I say this at some risk I suspect, but for 75 years in rural America the Federal Government has financed everything with good reason, whether it was rural electricians or telephone or digging the ponds or laying the tile or building the terraces or, for that matter, financing agri-business. We have become very dependent upon that, and as a result most rural lenders today singularly focus on balance sheet lending, and so it's very difficult for them to convert over when you look at structured debt opportunities or structured finance or asset-backed financing opportunities. And we need to take a look at how to do that better so we can capture that wealth.

Senator GRASSLEY. Thank you. And, Mr. Heine, does Magellan see an opportunity to transport biodiesel blend via pipeline anytime in the near future?

Mr. HEINE. Well, thanks for the question, Senator. In fact, we're going to be testing a B5 blend or 5 percent biodiesel and 95 percent diesel fuel later this year from Houston to Dallas in our pipeline system. We have a number of technical issues that we want to study and a number of commercial issues that yet need to be resolved as it relates to the large-scale potential transportation of biodiesel blends via pipeline. There are a number of factors that, unlike ethanol, on the technical side, biodiesel has some regulatory issues that need to be resolved and some other commercial issues.

And let me give you two quick examples. One of the commercial issues is the State of Minnesota has individually mandated the use of biodiesel of B2 blend. Their legislature this year may choose to up that to B5. A B2 blend in Minnesota complicates factors for us from a commercial perspective. The reason is, we bring gasoline and diesel fuel into Minnesota from a variety of different sources all the way from Houston. So it can be Texas refineries or Oklahoma refineries or Kansas refineries, but we also have local refineries in the Twin Cities. So if we had product, say in Des Moines, and we have a pipeline that runs directly from Des Moines to Minneapolis-St. Paul, if the product going into Des Moines contained 2 percent biodiesel and then we transported that into Minnesota, several of our terminals in Minnesota also serve South Dakota and North Dakota and then back here into Iowa as well, so we would have a product already in the tanks that contained biodiesel and our customers wouldn't have the option to take in non-biodiesel blends from those terminals into bordering States.

Now, if there were a regional approach, that would change that complexity, but for the time being that's one of the reasons that—there's a commercial reason to have biodiesel blending at terminals where the customers can choose the level of biodiesel that they desire. The regulatory issue that I mentioned earlier is one with ASTM, and that's the American Society for Testing and Materials, and many States adopt ASTM standards for diesel fuel. Similarly, in the future there will be an ASTM adoption for synthetic jet fuel which has not occurred yet, and that will be very significant, because States adopt those standards by law, and the current diesel fuel standard according to ASTM doesn't have a tolerance or provi-

sion for biodiesel, for a percentage of biodiesel. So that is in the works, but it's not here yet. And so the products that we transport in our pipeline meet that ASTM specification in many midwestern States. So once ASTM resolves that problem, then that will help free up the regulatory issue, but from the technical standpoint we don't see the same challenges with biodiesel as we do with ethanol in the stress corrosion cracking I mentioned earlier.

Senator GRASSLEY. What type of infrastructure is required to blend biodiesel?

Mr. HEINE. Senator, we bring biodiesel into a terminal via truck or rail car carrier, and at the terminal we have segregated storage, and by that I mean a separate tank for biodiesel. It will be insulated. The lines from the tank to the rack where we physically load the trucks will also be insulated, and we keep that product at some 60 degrees even in the coldest of winter months. We need to do that to make sure that the biodiesel blends proportionately with diesel fuel.

The blending systems that we have at the terminal are called ratio blending systems. What I mean by that is we're going to load, for example, 1,000 gallons in a transport truck with a biodiesel blend. Let's say it's a B2 blend. And so 980 gallons of diesel fuel would go into the truck. At the same time 20 gallons of biodiesel would go into the truck. So it's being blended proportionately at the same time to end up with a B2 blend. That is referred to as at-the-rack blending, Senator.

And the comparison would be below-the-rack blending. Below-the-rack blending would be an example of where the truck loads the diesel fuel at a petroleum terminal and then goes across the street to a biodiesel bulk plant to load the additional 20 gallons of biodiesel. In the future we'll continue to invest in biodiesel blending systems, as I explained, that would provide at-the-rack services. Our customers, which are many refineries and others that are very quality conscious as it relates to the percentage of biodiesel blending to make sure of its accuracy, like the types of systems that are provided at petroleum terminals and specifically the ratio blending system that I referenced. It provides a number of benefits to ensure the quality of the blend and the accuracy of the blend as well. So we're continuing to invest in that type of system in the future and, in fact, we just recently finished installing a ratio system at our terminal in Mason City.

Senator GRASSLEY. Now, Mr. Accinelli, it's my understanding that Dubuque University being a 501(c)3 non-profit means that the flight school is able to purchase tax-exempt fuel. Why is this exemption important to retain?

Mr. ACCINELLI. Well, for any not-for-profit educational institution, fuel at the aviation training level has become probably the number 2 cost in a program, personnel being the number 1, and students today graduate with a tremendous amount of debt. In our program it costs about \$42,000 to get them through their flight training, laboratory fees, professional ratings, and other necessities to be hired in the industry, in addition to the books, tuition, and those kind of things. So it's really an issue of cost and it's an issue of debt load for our students who are entering an environment

where the pay initially in the first 3 to 5 years is really entry-level, \$20,000, \$25,000 pay.

Senator GRASSLEY. And also for you, what challenges and benefits will next-generation air traffic control bring to low-activity towers like the one here at Dubuque?

Mr. ACCINELLI. That is actually one of my areas of interest, and I'm glad you asked me, Senator. The issue here is, we have a growing traffic density for the tower here at Dubuque. Many underserved communities that have towers are contract. The technology has not been exported to them, yet we have tremendous separation issues, abilities to communicate with aircraft, and it adds a level of safety and expedites traffic flow and makes us more efficient, all of those advantages that come from being able to put this new technology that is not ground-based, per se, into our facilities.

Senator GRASSLEY. Okay. And, Dr. Holmes, will your business model be expandable into other rural regions such as the Midwest or western mountain regions?

Dr. HOLMES. Well, the answer is yes, so let me give you an example. Say there was a Senator in a midwestern State, for example, who visited every county in his State annually, needed to make a trip say from a city like Dubuque to a place like Spencer to another place like Knoxville. When you do the math, that's about 600 plus miles of driving. It would require 3 days, 2 nights for the travel alone, never mind the meetings that would take place. So what can be possible is to do all of that in 1 day, at a cost that, when you compare it to driving, is competitive, not even perhaps counting the value of the time of the individuals traveling. So what we understand about the way in which the DayJet business model works is, it is scalable to other regions. We don't know when we'll be in Iowa. Our ability to expand our business model is dependent on a couple of things, one of which is the rate at which Eclipse Aviation produces the aircraft we have ordered. So we'll start in the southeast six States this year, expanding as the deliveries of aircraft come into place. I'd like to say just a little bit about what it is that makes this innovation possible. One is, of course, the aircraft. The aircraft represents a revolution in the cost of speed. It gives us the ability to fly at speeds in excess of 400 mph for a third of the cost of being able to do that in the past.

A second element is the creation of the real-time logistics software systems that the company invested in over the past 5 years that allow us to manage fleets on demand rather than as scheduled operations. This has never been done before in transportation. So it's a rather unique and absolutely essential part of the equation. So you have to have the aircraft and have to have the logistics capabilities that we have.

There's a third part that will either accelerate or inhibit the expansion of our business model to other places, and it's the air space. We must have the ability to fly in to every one of our airports without missed approaches, without procedure turns, without holding patterns, and without being vectored around to the other side of the airport because the ILS only serves that direction and the back course isn't good enough. We can't have that, because, when you do the math on the network performance for our fleets, it really starts to hurt the ability of consumers to pay the price we

would have to charge for doing all of those things. And so NextGen brings us the third leg in the stool. We have the airplane, we have the software, now we need the air space capabilities. So our ability to grow into the market will be paced by the latter two, the production of the aircraft—the rate of production of the aircraft—and the air space ability to accommodate NextGen.

Senator GRASSLEY. I think you answered the question I was going to ask about NextGen. It was a follow-up question. There's obviously then for your planning, there's advantages to accelerating Next Generation development?

Dr. HOLMES. Well, we think there's an advantage to accelerating it, not just for airplanes. In the end, we believe that we can serve as a proving ground for NextGen operating capabilities that will matter to the rest of the users of the air space. One of the difficulties we're facing in working the acceleration challenge with the FAA, JDPO, NASA, and other agencies is that almost the entirety of their focus is on the OEP 35. It's a little bit like looking for your lost keys under the streetlight, because that's where the lighting is. Well, yes, we have to solve those problems, no question about it, but, if we forsake the rest of the 3,500 airports or more—actually 5,000 public use airports—in America, in the interest of only solving the problem of the OEP 35, we won't get where we need to go.

In fact, there's a study that came out of the FAA administrator's office, which is the 2007 capacity report, it just came out last month. What it says is that, even after we have done everything we know we need to do in NextGen, in the year 2025, if that's all we do at the OEP 35 airports that handle 90 percent of the passengers, we'll still have 14 of those airports that will be as bad or worse than today. We'll not have solved the problem. So we must have focus outside of the OEP 35, and we believe that, in demonstrating the capacity to expand the air space outside of the OEP 35 air space, that we enable such an opportunity for airplanes.

Senator GRASSLEY. Are you going to be able to compete—maybe I ought to ask you, how are you going to be able to compete with other transportation choices?

Dr. HOLMES. Well, actually one of the bits of homework that's occurred over the past 5 years is the development of what we call an agent-based model for understanding how people make decisions to travel. And so the agent, we're talking agent-based modeling as a term that comes out of the world of complexity science. A lot of that developed in the U.S. over the past decade or more and with some true break-throughs in capability, including the capability to assess the complexity of transportation decision-making by the traveler. So we have built models, if you will, of how people make decisions, in mode choice, in cost against how much their incomes are and where they live and what choices they have access to. It's a very complex model. We have modeled over 2 million trips just in the past year or so alone using this software. What we understand is what's on the mind of the crowd, what's on the mind of the individual when it comes to travel, how are they going to choose. So what we know is that we will take—most of our travelers will come off of highways, and the reason is quite simple. We're regional travelers out to about 600 miles, trips that people by and large are making mostly by car today. And so we believe, based on the mod-

eling we have done—and comparing our models to reality will show us the model is really pretty impressive—that people will decide to come off of the highways and travel in a way that we can offer.

We have also seen, oddly enough, that some of the, maybe it's not so odd in the end, some of the people whom we pull into traveling in DayJets will choose to fly home on the airlines. So there's actually a very tiny slice of additional travel that comes to the airlines as a consequence of what we bring to the market.

Senator GRASSLEY. Well, that's all the questions that I have, but I want to remind everybody as those who are already in Federal Government know, as sometimes happens at a hearing like this, I'd like to remind you that there are 20 other members of the committee and you may get questions in writing, and we would like to have those questions responded to. What do we generally say, in 10 days? If you could respond within 10 days after you get questions, if you do. You may not in this instance, but then I can't speak for any of the other members of the committee, and we always encourage people to submit questions for answer in writing.

So I want to close by once again thanking all of the witnesses, who have come a long ways. I can't thank you enough, because this testimony is very important to the needs that have to be addressed. The Finance Committee is going to consider this information as we move forward specifically on the airport and airway trust fund reauthorization. But also don't forget that I've already mentioned that we have other tax issues, such as the farm bill, and there are other provisions in the farm bill unrelated to the tax provisions that have things to do with alternative energy, and then, of course, we still have the energy tax bill to complete and to move through Congress and out of Congress.

So once again I thank Dubuque for its hospitality, because this Dubuque hearing represents hundreds of airports all over rural America with the same or similar issues, and it's my feeling we can't continue to serve rural America the way we ought to if we fail to grow flight opportunities in rural America. In fact, you would be surprised at the number of economic development people who contact me on a regular basis for airports a lot smaller than Dubuque who simply say, "If we're going to get the industry we need to have," or I should say not just industry, "the industry and business that we need, we're going to have to improve our airport, relocate our airport, or extend the runway of our airport." This is something that comes up quite regularly, and I know about it, because it sometimes tends to be controversial when it involves the condemnation of agricultural land, somebody's farm that has been in the family a century, and they consider that the constitutional right to protect your property, with eminent domain not enough for them, and they don't want this around. But that's some of the issues you come up with. And so I want you to know we're aware of it from both sides of the calendar, but we move ahead because airports are very, very important for rural economic development. I'm going to also continue to study carefully any trust fund proposals that do not adequately represent rural service.

Thank you very much, and the hearing is adjourned.

[Whereupon, at 11:40 a.m., the hearing was concluded.]

# APPENDIX

## ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD



11000 Airport Road → Dubuque, Iowa 52003

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[www.flydbq.com](http://www.flydbq.com)

Airport Commissioners → Steve Accinelli Doug Brotherton Sue Czeshinski Charles Daoud Mike Santillo

– FIELD SENATE TESTIMONY –  
AUGUST 27, 2007-  
DUBUQUE REGIONAL AIRPORT

Good Morning –

I am pleased to be here representing the greater Dubuque community. I am Steven Accinelli a resident of the City of Dubuque currently serving as the Director of Aviation Programs at the University of Dubuque and I also serve as the Chairperson for the Dubuque Regional Airport Commission.

**Air service, both Commercial and General Aviation, is the single most essential component in the new global economy.** This is as true for Dubuque, Iowa as it is for Chicago or New York.

Let me introduce you to Dubuque.

Our economy has defied the odds over the past ten years. Progressive attitudes, capital investment, public-private cooperation and careful planning have been the ingredients for success that has resulted in unprecedented job growth. Moody's/Economy.com noted that Dubuque's employment growth remains "robust at triple the state and national paces." This respected firm added that Dubuque "has historically defied expectations" as development has staved off recessionary conditions. Forbes magazine places Dubuque in the U.S. Top 15 on its list of best places for business. In Iowa, Dubuque ranks number #1 for private sector job growth among Iowa's metro areas for the past twelve months.

### **Aviation Commercial Infrastructure**

Aviation Commercial Infrastructure is critical for growing communities. Airports, traditionally, have been good economic engines when properly managed and supported. Major corporations who seek to establish a presence in a community need a robust transportation infrastructure. An airport with commercial service and facilities for business, charter, medical, and government air services is simply a necessity if a community is to succeed in global marketplace. The Dubuque Regional Airport serves local businesses as well as national corporations with "road warriors" traveling weekly to all parts of the United States, Europe and the Asia. McGraw Hill, John Deere, Prudential, McKesson Corporation and all our businesses require air connectivity to conduct their businesses. Eight higher education colleges and universities in the Tri-State Area also depend on commercial air service.

In 2000 the Dubuque Regional Airport had 59,000 enplanements and was served by 3 air carriers; American Eagle, United Express, and Northwest Airlink serving three hubs (Chicago, Detroit, Minneapolis). Today only American Eagle serves the Airport with four daily flights to Chicago and accounting for nearly 50,000 enplanements. In 2003, through the combination of a Small Community Air Service grant of \$610,000 and an organized, unified and well funded marketing campaign led by the local Chamber of Commerce, "FLY DBQ" was launched to increase frequency and passenger load – a "use it or lose it" proposition.

Additionally, the community supported the Airport with a \$250,000 travel bank. This successful grant was closed out in May 2006 and the fourth flight continues to this day.

Gaining additional air service has been, to date, nearly impossible to attain. Airlines continue to operate on very small margins and require strong incentives to take the risk of moving into a new community or reestablishing themselves in former communities. They continue to look for every operational advantage and revenue guarantees. In order for Dubuque to gain more frequency or gain access to additional hubs, air carriers are forced to sacrifice service to other communities. There are a multitude of factors which determine "who gets what." If it was purely actuarial crunching that delivered additional flights or carriers to small regional airports – little or no service would be provided to key rural regions of our country.

The City of Dubuque has done a magnificent job of developing the downtown area, the river, and local charm to enhance the tourism trade but has not spent a commensurate amount of time in establishing multiple ways of getting people here. One air carrier with 4 departures per day simply is not enough to entice easy access to and from other locales. Further, the ridership on our four flights is averaging in excess of 74% full. Limited capacity is making it difficult and costly to attain remaining seats and it precludes additional Tourism travel. If Dubuque is to grow; we need more access to this great and emerging community called Dubuque.

#### **General Aviation**

Rural and underserved communities require strong commitments from its general aviation activities to continue business growth and global reach. Medical flights today are even more important to underserved communities. Here at Dubuque we have seen an increase in business aircraft, charter flights, and owner operated aircraft to sustain viable growth. Transient as well as jet fuel purchases indicate an active market while fuel sales continue to decline from airline tankering policies. Dubuque is limited by its ability to grow its support of business aviation by its lack of hangar, ramp, and available office space. Enticing a quality charter operator or any other aviation business to the Dubuque is difficult. We must not forget that general aviation has become key to sustained growth of a community, yet funding for adequate infrastructure lags commercial air service funds. Rural and underserved communities may need funding in a different and non-traditional manner.

#### **University Flight Programs**

Currently University flight programs provide our nation with the majority of qualified pilots being hired by the Regional airlines today. Demands for qualified pilots are the highest since 2000. The level of hiring of pilots by US airlines and international operators is forecast to remain robust and the majority of hires will come from university flight programs through at least 2017. The University of Dubuque (UD) is not-for-profit private institution of higher education conducting flight training from its base at the Dubuque Regional Airport. UD's Aviation programs have over 210 students, with 23 multi and single-engine aircraft and a staff of 35.

The University of Dubuque is the only bachelor degree institution in Iowa offering professional aeronautics and aviation management training in the State of Iowa. UD is one of approximately 80 four-year degree granting institutions with aviation programs. The University of Dubuque has a nationally recognized program based on its high standards as recognized by the Aviation Accreditation Board International, its high job placement rate, and its arrangements with key employers like American Eagle Airlines with which UD has a preferred hire agreement.

I remain very concerned about the cost our students must incur to become professional pilots and the access to the aviation infrastructure necessary to train the World's safest pilot workforce. Reasonable fuel prices and access to energy alternatives for aviation fuels is a critical need. The US is the world leader in aviation training. We need to protect this capability and maintain our leadership and opportunities for our pilot workforce. Post-graduate training programs and for profit flight training remain sensitive to the potential of user fee and the volatility of higher fuel taxes. Protecting the United States' ability to train the next generation of airline and business pilots is critical.

**Contract ATC Towers**

Contract ATC towers remain essential to ensure safety and support for growing and emerging high performance communities. Today, the Dubuque Regional Airport is fast approaching the second busiest airport, based on flight operations, in the State of Iowa. The fielding of Next Gen and other key ATC technologies will only enhance the safety in Dubuque and other locations.

A recent incident with a University of Dubuque student who became disoriented due to low clouds was helped by technology in an American Eagle aircraft on the ground because the tower did not have that same level of technology. Had the aircraft not been assisted by technology on the American Eagle aircraft – the outcome of the incident could have been quite different.

As communities change and grow, it appears that only Contract towers provide the flexibility to assist communities to provide safe air traffic management on relatively short notice to abate air traffic issues. Contract ATC towers clearly contribute to the opportunity for further business, commercial air traffic growth, and the improvement of safety in the aviation infrastructure.

**Conclusion**

The City of Dubuque and its Airport Commission have been proactive in attempting to secure the best value for its citizens and surrounding communities. Support to rural/underserved communities' aviation infrastructure is critical for market access, employment, growth, safety, and quality of life issues. Funding is necessary and deserving for Iowa's communities.

I would like to thank Senator Grassley for giving Dubuque an opportunity to share its story.

**Statement of Chairman Max Baucus  
Senate Finance Committee Field Hearing: Airfields and Alternative Fuels  
Dubuque, Iowa  
August 27, 2007**

Today's hearing explores two issues that are critical to the well-being of rural economies and the individuals who depend on them: transportation and energy. Whether it's airways or highways, ethanol or crude oil, transportation and energy are critical to economic development. This is especially true in rural areas like Montana and Iowa, where distances are great and populations are small.

The issues of transportation and energy are closely linked: as air travel grows, energy use grows with it. Last year the Federal Aviation Administration projected that the number of aircraft in the U.S. commercial fleet will grow from around 7,600 in 2006 to about 11,000 in 2020. The general aviation fleet is expected to increase from about 225,000 planes now to 275,000 in 2020. And as air traffic increases, the use of fossil-based aviation fuels will also grow fast: FAA estimates that airlines' fuel consumption will increase by more than 68% in the next 15 years. Fuel consumption by general aviation aircraft is expected to triple. This rise in the use of fossil fuels increases our dependence on foreign oil and adds to the growing problem of climate change.

That's why it's important that we push the use of alternative fuels in both aviation and surface transportation. The Senate Finance Committee has passed legislation to advance the use of ethanol, biodiesel and other alternative fuels for surface transportation, and I will keep working until this legislation clears the full Senate and becomes law.

As for aviation, the Finance Committee will consider legislation in the coming weeks to reauthorize the Airport and Airway Trust Fund, including implementation of the Next Generation Air Transportation System (NextGen). NextGen is a satellite-based means of managing air traffic that will allow us to handle more flights with fewer delays, leading to more efficient use of fuel in the process. Today's testimony will provide important input for this debate.

Witness testimony will also provide background on some of the important alternatives being developed for aviation fuels, including the Air Force's efforts to develop synthetic jet fuel. The Air Force is aiming to derive half of the fuel it uses in the lower 48 states through a synthetic blend by 2016. I am interested to learn about the Air Force's progress in reaching this goal, as well as its plans to develop these synthetic fuels in an environmentally-sound manner.

For those interested in transportation and energy policy, these are exciting times. From biofuels to satellites, from very light jets to clean coal technology, the landscape of transportation and energy policy is in a state of dramatic change. Our task is to ensure that this change is brought about for the good – and that Rural America is not left behind in the process.

Thanks to our witnesses for their participation in today's hearing. I look forward to a full review of their testimony.

**CARL O. BAUER**  
**DIRECTOR OF NATIONAL ENERGY TECHNOLOGY LABORATORY**  
**U.S. DEPARTMENT OF ENERGY**  
**BEFORE THE SENATE COMMITTEE ON FINANCE**  
**FIELD HEARING ON "AIRFIELDS AND ALTERNATIVE FUELS: EXPLORING**  
**RURAL AMERICA'S TRANSPORTATION INFRASTRUCTURE"**  
**AUGUST 27, 2007**

Thank you Mr. Chairman. I appreciate this opportunity to provide testimony on the Department of Energy's (DOE's) advanced clean coal technologies. I fully support the President's 20 in 10 goal for alternative liquid fuels, including cellulosic ethanol, ethanol, biodiesel, and coal-derived liquids.

The economic prosperity of the United States over the past century has benefited by the abundance of fossil fuels found in North America. The United States' fossil fuel resources represent a national asset that is important to our energy security and global economic competitiveness. However, concerns over climate change and air pollution challenge our ability to take full advantage of our fossil fuels resources.

The sometimes competing priorities of improving energy security by reducing fuel imports, while simultaneously mitigating energy-related GHG and air pollution emissions, can inject uncertainty into the business decisions that can inhibit energy project development. The present legal and regulatory uncertainties surrounding the mitigation of GHG and the significant increase over the last several years in world oil and gas demand are other factors that contribute to this uncertainty within the business community. The development and introduction of

advanced and cost-effective technologies that employ domestic fossil fuel resources and improve GHG and air pollutant emissions could help reconcile these goals.

One potential technology that could support these strategic energy objectives is coal-biomass-to-liquids (CBTL). This approach represents a process that uses both coal and biomass gasification combined with technology to produce liquid transportation fuel products, while incorporating technology to mitigate CO<sub>2</sub> emissions via carbon capture and storage. CBTL provides an opportunity to apply the Nation's abundant coal reserves and biomass potential to the creation of alternative liquid transportation fuels, contributing to strengthening our Nation's energy security. This process can potentially improve GHG emissions, compared to traditional refining, while meeting the mitigation requirements for all other pollutants.

If CBTL were to become a viable economic technology option, it would depend on technologies including coal and biomass gasification, syngas-to-liquids, carbon capture and storage, and enhanced oil recovery.

#### **Gasification and Coal-to-Liquids (CTL)**

To date, CTL has only been used by countries without access to world petroleum markets, and has been uneconomic compared to petroleum. China is currently developing CTL plants, but while potentially economic in China the environmental criteria imposed by China are not as stringent as in the U.S. The designs China is considering may almost double the GHG emissions compared with petroleum transportation fuels.

Efforts in conversion of CTL in the U.S. accelerated after the Second World War. The Bureau of Mines began pilot-scale testing aimed at extending German synthetic fuels technology. This was followed by the construction and dedication on May 21, 1948, of coal to

synthetic gas and liquid fuels laboratories and pilot plants (both direct and indirect liquefaction technologies), including coal gasification experimental work.

Work in the 1970s on integrated gasification combined cycle (IGCC), which is for electricity generation, resulted in two clean coal technology demonstration projects – Tampa Electric and Wabash River. The only large-scale coal and biomass gasification experience in the U.S. has been performed in the Tampa IGCC plant. Over the past fifteen years, DOE has invested significantly towards R&D required for the advancements in gasification systems. As a result of this investment, a third IGCC demonstration project, based upon the transport gasifier developed by DOE in partnership with Southern Company, is under development in Orlando, Florida. Additionally, advanced air-separation technologies and high-temperature gas-cleaning technologies are progressing to large-scale testing at commercial coal gasification plants, making these technologies ready for demonstration in FutureGen. (FutureGen is a Government-industry initiative to design, build, and operate an advanced coal gasification-based, near-zero atmospheric emission, coal-fired electricity and hydrogen production plant.) The commercial U.S. operating IGCC plants and the advanced process technologies have been realized through cost-sharing partnerships with industry.

DOE's work on gasification has evolved from its early days of laboratory, bench, proof-of-concept demonstration scale research to its current state-of-the-art computer-based computation, modeling, visualization, and simulation approach validated by experiment. Unique capabilities exist to model the dense, reacting multiphase flows that are encountered in coal and coal-biomass gasifiers. In addition, modeling at the atomic scale of the Fischer-Tropsch (F-T) catalytic reaction of carbon monoxide and hydrogen to produce clean liquid fuels has been under investigation since 2000, but has been discontinued because F-T is a mature technology subject

to evolutionary advancements for which industry has adequate incentive to develop without government assistance.

The F-T process for production of liquid fuels from coal starts with gasification. Coal is fed to a gasification system that produces a gas mixture consisting mostly of carbon monoxide, hydrogen, and carbon dioxide. This gas mixture is further processed to remove carbon dioxide and trace contaminants, such as sulfur compounds and mercury. This clean gas mixture is sent to a chemical reactor where the gas mixture is catalytically converted to liquid products. After a moderate amount of on-site petrochemical fuel processing, a commercial CTL plant would produce a near-zero sulfur, high-performance diesel fuel for automotive applications and a near-zero sulfur jet fuel for commercial or military applications. Between one-third to one-half of the product of commercial CTL plants would be a mixture of liquids (primarily naphtha) that can be used to manufacture motor gasoline, either at the CTL plant site or at a petroleum refinery.

Since the end of World War II, the only commercial experience in CTL production has occurred in South Africa under government subsidy. In particular, a South African synthetic fuels capacity constructed from the 1950s through the 1980s currently produces fuels and chemicals that are the energy equivalent of about 150,000 barrels per day of oil.

According to the Energy Information Administration (EIA) the U.S. demand for petroleum in 2005 was 20.8 million barrels per day. Of that amount, 12.5 million barrels per day, or 60 percent, was from net imports. Domestic production of transportation fuels such as CTL, CBTL, cellulosic ethanol, ethanol, and biodiesel, would have positive national security benefits by reducing our foreign oil dependence.

**Carbon Capture and Storage (CCS)**

The technology option represented by CCS could be used in conjunction with the CBTL technology concept, as the CO<sub>2</sub> produced and stored from the biomass component of the feedstock can derive negative GHG emission balances due to the photosynthetic carbon being drawn from the air and stored underground. The benefits claimed for GHG reduction for biomass co-feeding scenarios account for photosynthetic carbon uptake. This represents an option for substantially mitigating the otherwise undesirable GHG emissions performance of a CTL plant, compared to traditional petroleum refining.

Over a decade of effort has been underway in DOE's Sequestration Program relating to CCS technologies, which was formally defined as a program in 1997, with an initial budget of \$1 million. Funding for CCS has steadily increased over the past ten years to a level of around \$100 million in Fiscal Year 2007. Cumulative funding over the past decade is on the order of \$360 million. Research has focused primarily on capture and storage of CO<sub>2</sub> for electricity generation applications, though many of the technologies could be used for other applications. As part of this effort, the program has organized Regional Partnerships to address infrastructure issues for carbon storage. NETL, in conjunction with the Regional Partnerships, have performed and published a capacity assessment for geologic storage showing adequate storage potential for hundreds of years. DOE is moving into Phase 3 (Deployment Phase) whereby large volumes of CO<sub>2</sub> will be injected for storage, which will help to significantly advance geologic sequestration as a viable carbon mitigation option.

CTL and CBTL systems are easily amenable to carbon sequestration because a large degree of CO<sub>2</sub> separation is inherent to the process.

**Enhanced Oil Recovery (EOR)**

Although much of the Nation's recoverable onshore petroleum resource has been produced, large volumes of crude oil remain in place after current production methods are exhausted through technology referred to as EOR. These remaining oil resources are held in place by physical forces or left behind due to geologic complexity being both economically and technologically challenged. The total volume of this stranded oil is estimated by Advanced Resources International of Washington, DC, to exceed 390 billion barrels, of which roughly 200 billion barrels are estimated to be relatively accessible at depths of up to 5,000 feet but do not have CO<sub>2</sub> available for EOR. To put these numbers in context, according to EIA, we have produced about 195 billion barrels of our petroleum resource over the past nearly 150 years and currently have proven reserves of roughly 22 billion barrels (Source: EIA online database, as of December 2005; crude oil, does not include natural gas liquids).

Incremental oil produced from EOR applications could help offset the costs of CO<sub>2</sub> capture in CBTL opportunities, while the prospect of low-cost supplies of captured CO<sub>2</sub> in widespread areas of the country could provide the impetus for a national re-evaluation of the EOR potential in many mature fields. Long-term GHG benefits would only be realized if the EOR would be implemented in a manner that ensured the permanent storage of the CO<sub>2</sub>. While EOR is a technology that has been in commercial use for decades, CO<sub>2</sub> capture from processes such as CBTL is not yet commercial. Continued evolution of EOR and transformational advances in development and deployment of CO<sub>2</sub> capture from CBTL could help realize this synergy between the new alternative fuel industry and the traditional oil industry.

While the challenges are significant, the U.S. has experience in the relevant technologies. The oil industry has been using CO<sub>2</sub> for EOR in commercial applications for decades. As early

as the 1970s, DOE-funded projects were assessing the fluid properties of CO<sub>2</sub> to establish its applicability in EOR. A special focus was given to developing correlations that helped the oil industry utilize these properties to optimize commercial EOR projects. During 1993-2003, DOE funded nearly half of the \$100 million spent on the Class Program CO<sub>2</sub>-EOR Field Demonstration Projects. Approaches included the use of horizontal wells for improved reservoir contact, four-dimensional seismic to monitor the behavior of CO<sub>2</sub> floods, automated field-monitoring systems for detecting problems, and the injection of increasingly larger volumes of CO<sub>2</sub> to increase recovery rates. This DOE-funded research has helped advance industrial EOR operations, but the focus is now on the carbon sequestration side of EOR, which is focused on developing technology to maximize CO<sub>2</sub> storage in producing oil fields. DOE-funded research continues to include research on carbon sequestration in the context of EOR.

#### **CBTL and Environmental Benefits**

While a large CTL industry could have positive national security benefits there are economic challenges and environmental costs that need to be considered. If no provisions are in place to manage CO<sub>2</sub> emissions, then the use of CTL fuels to displace petroleum fuels for transportation will roughly double GHG emissions. Theoretically, GHG emissions from CBTL systems can be well below those associated with the use of conventional petroleum fuels, depending upon the specific design of the CBTL system and the proportion of coal and biomass feed to the system.

Co-feeding at these levels is well within the range of large-scale plants (12 percent by energy and 20 percent by weight) amounts of biomass. At the NUON plant in the Netherlands they successfully fed a mixture of coal and 30 percent (by weight) demolition wood into a high-pressure, entrained-flow gasifier. The amount of biomass available and able to be utilized at a

CBTL plant with CO<sub>2</sub> capture and storage may or may not be sufficient to provide the GHG benefit versus petroleum-based fuels.

A more advanced case from Professor Robert Williams, of Princeton University, illustrates how a CBTL system with 38 percent (on an energy basis) switchgrass feed will result in a life-cycle GHG emission rate of zero. Due to the high amount of biomass in the feed and the high percentage of carbon sequestration (approximately 90 percent), this system does not increase the amount of CO<sub>2</sub> in the atmosphere, even considering the fuel emissions at the tailpipe of vehicles using the product fuel. Thus, this system represents an opportunity to not only mitigate the impact of carbon fuels at stationary sources, such as the CBTL production facility, but also to mitigate the impact of mobile sources such as automobiles that burn the product fuel.

The context of the total fuel life-cycle evaluation is well-to-wheels or coal-mine-to-wheels. A “well-to-wheels” analysis considers the GHG emissions from all parts of the production supply chain. For petroleum liquid fuels, the steps include crude oil extraction, crude oil treatment, crude oil shipment to a refinery, refinery processing, delivery of finished product to a dispensing station, and end-use combustion emissions.

Another aspect of CBTL systems is the tradeoff between biomass and coal as a feedstock. Increased coal greatly reduces the amount of biomass needed to produce a given amount of liquid fuel, but it increases the carbon emissions. Conversely, increased biomass greatly increases the amount of biomass needed to produce a given amount of liquid fuel, but it decreases carbon emissions. Another important consideration is the economic impact of replacing coal with biomass.

Analysis performed by Professor Williams indicates that the biomass energy input needed to produce liquid fuels via CBTL is 50 percent or less than the amount of biomass energy

needed for a corresponding amount of corn-based ethanol. This more efficient use of biomass has two benefits. First, lowering the amount of biomass needed to produce a set amount of liquid fuels lowers pressure on the agriculture industry to find suitable land to grow the biomass needed for liquid fuel production. Second, there is an economic trade-off between the amount of biomass that can be delivered to a central processing facility and the distance needed to deliver the biomass. By including coal in the feedstock, the central CBTL facility can be larger than the corresponding 100 percent biomass facility, and can take advantage of economies of scale in construction and total output of liquid fuel.

Non-food crop biomass resources suitable as feedstocks for CBTL production plants include switchgrass, corn stover, short rotation woody crops (poplar), forest residues, mixed prairie grasses, and crops that would be grown on dedicated energy plantations. Because CBTL can use non-food biomass as a feedstock, this will reduce pressure on supply of food-based biomass production. In addition, CBTL facilities would provide a stimulus to the agriculture industry to develop the infrastructure and biomass resources needed to provide cellulosic biomass for the production of liquid transportation fuels, which can also support future opportunities for cellulosic ethanol production.

Under one scenario for the coal-biomass feedstock mix, a CBTL facility would produce about 0.8 short tons of CO<sub>2</sub> along with each barrel of liquid fuel. For CBTL plants located near oil fields with recoverable crude, this CO<sub>2</sub> can be used to drive additional oil recovery. Based on studies sponsored by DOE, opportunities for EOR provide carbon management options for at least a half million barrels per day of CBTL production capacity. As a consequence of using EOR for carbon management, this half million barrels per day of CBTL liquids will promote an additional one million barrels per day of domestic petroleum production. Although capacity for

CO<sub>2</sub> sequestration through EOR in the U.S. is much smaller than total U.S. CO<sub>2</sub> production over time, EOR activity will provide important early opportunities for advantageous economics for utilization of CO<sub>2</sub>.

The economic viability of CBTL is dependent upon several assumptions, including exact configuration of the facility, proportion of biomass in the feed, the value (if any) assigned to the disposition of captured CO<sub>2</sub>, and the value of any power sold to the electricity grid.

The conversion of clean synthesis gas to liquids, as practiced by SASOL in South Africa, is commercial. However, the introduction of biomass to the front-end of the process (i.e., CBTL), when combined with sequestering the CO<sub>2</sub> produced in feedstock conversion, presents unique challenges and offers the opportunity to produce fuels, electric power, and hydrogen with a much reduced, and even net negative, life-cycle carbon footprint. To our knowledge, a CBTL technology that is capable of producing clean liquids, hydrogen, and electric power, on a carbon neutral, or net negative, life-cycle basis is not commercially available anywhere in the world today, nor is it economic.

### **Conclusion**

The prospect for the development of a CBTL industry in the United States has resulted from decades of development of enabling predecessor technologies that can be combined with the President's 20 in 10 goals for cellulosic ethanol, ethanol, and biodiesel to provide a solution to both energy security and reducing GHG emissions for the Nation. If economic, a CBTL industry could become a domestic source of liquid transportation fuels production, helping enhance domestic energy security. The carbon capture and storage associated with CBTL could help mitigate the adverse GHG affects associated with a standard CTL process, and could improve upon normal refining plant emissions. With varying proportions of biomass, CBTL

could achieve levels evaluated as GHG neutral. Such zero GHG emissions for the process would not only apply to the stationary fuel production plant emissions but also the tailpipe emissions of vehicles using the product fuel from the plant, providing an avenue for GHG mitigation within the transportation industry.

Early CBTL opportunities with access to parallel EOR opportunities can offer avenues to offset the added costs of CO<sub>2</sub> mitigation. They can also support increased domestic fuel production by roughly two barrels of EOR production per barrel of CBTL production.

Combining coal and biomass in a CBTL production facility allows for the production of significantly larger volumes of environmentally acceptable domestic transportation fuels, per unit of biomass, a factor that will become increasingly important as our potential biomass resources are increasingly brought into the Nation's energy mix.

The primary barriers to commercial introduction of CTL technology, and by extension to CBTL technology, have been the: uncertainty of world oil prices; high cost of production coupled with high initial capital cost (\$70 to \$90 thousand dollars per barrel of daily capacity for the first U.S. plant, for a total cost of \$3 billion or more for a full-scale plant) and the long decision-to-production lead times (which could be in the seven-year range).

**WITNESS STATEMENT OF  
MR. KEVIN W. BILLINGS  
DEPUTY ASSISTANT SECRETARY  
ENVIRONMENT, SAFETY, AND OCCUPATIONAL HEALTH  
BEFORE THE  
SENATE COMMITTEE ON FINANCE FIELD HEARING**

**AUGUST 27, 2007**

Senator Grassley, thank you for the opportunity to appear today to outline the Air Force Energy Strategy for the 21<sup>st</sup> Century, and to describe some of our recent achievements. I am Kevin Billings, Deputy Assistant Secretary of the Air Force for Environment, Safety and Occupational Health.

The Air Force is engaged every single day in global operations, fighting the Global War on Terror, defending our homeland, providing strategic deterrence, and giving our nation unparalleled Global Vigilance, Reach and Power. Air Force global expeditionary air, space and cyberspace forces provide **vigilance** that is persistent, focused and predictive; **reach** that is reliable, rapid and agile; and **power** that is precise, stealthy and decisive.

Your Air Force has been in continuous combat operations for over 16 years – since the beginning of Operation DESERT STORM in 1991. We fly over 250 daily sorties in Iraq and Afghanistan and flew over 80,000 sorties in the past year. Since September 11, 2001, we have flown over **48,000** sorties in America's skies to protect our homeland.

Air Force global operations require a tremendous amount of energy – we consumed almost 2.6 billion gallons of aviation fuel in fiscal year 2006 at a cost of almost \$5.8 billion, with a total energy bill exceeding \$7 billion when we include energy to operate our bases and fuel for our ground vehicles.

The United States currently imports nearly 60% of its petroleum products -- and that number is expected to rise to 68% by 2030. Our top six foreign suppliers of crude oil to the United States are Canada, Saudi Arabia, Mexico, Venezuela, Nigeria, and Iraq. Over half of the world's oil supply travels through the Straits of Hormuz and another quarter of the world's supply travels through the Straits of Malacca. These are two of the world's most salient shipping choke points.

The growing economies of China, India and the rest of Asia are expected to continue to increase world-wide petroleum demand. The Chinese have already spent over \$45 billion since 2000 on oil and gas exploration throughout the world.

For multiple reasons, including the global energy environment, the Air Force and is a primary driver behind the Air Force energy strategy -- to reduce demand, increase supply, and change the culture within the Air Force so that energy is a consideration in everything we do.

The Air Force has an aggressive facility energy conservation program that achieved an impressive 30% reduction in energy use over the past 20 years. Your Air Force is the Federal Government's largest purchaser of "green power" and the fifth largest in the nation overall. In fact, two of our bases, Dyess AFB in Texas and Fairchild AFB in Washington are powered nearly 100 percent by green power off the grid. Thirty-seven of our bases purchase green power.

We are a leader in renewable energy. At Nellis AFB in Nevada, in a partnership with Powerlight, a subsidiary of Sun Power Corporation, we are installing North America's largest solar photovoltaic array. When operational at the end of this year it will produce over 14 megawatts of clean, renewable, power. We have installed over 7 megawatts of renewable energy at our other bases throughout the Air Force.

Nearly 8 percent of our diesel fuel is B20, which is a blend of 80 percent conventional diesel and 20 percent renewable bio-fuels. Today, 59 Air Force Bases are dispensing B20, and 15 bases are dispensing E85, with a 16<sup>th</sup> E85 station opening this week at FE Warren AFB, Wyoming. We have over 5,200 FlexFuel vehicles in our fleet.

Mr. Chairman and members of the Committee, I am sure you are most interested in the Air Force's plan to test, certify and fly using a synthetic aviation fuel. Air Force lore has it that Secretary Wynne was walking among rows of fighter jets and bombers one day when he heard a voice. That voice from the field of airplanes said, "If you certify them, they will come."

Much like the legendary Ray Kinsella, Secretary Wynne believes that by doing something out of the ordinary, the Air Force can make good things happen.

The Air Force Synthetic Fuels Initiative is a key part to our energy strategy. The Air Force is committed to certifying our entire fleet of aircraft to fly on a synthetic aviation fuel blend by early 2011. The Air Force goal is to cost effectively acquire one half of our contiguous United States (CONUS) aviation fuel via a synthetic fuel blend utilizing domestic feedstocks and produced in the United States by 2016. It is our intent to require that the synthetic fuel purchases be sourced from suppliers with manufacturing facilities that engage in carbon dioxide capture and effective reuse. Based on FY06 consumption rates, this equates to approximately 400 million gallons of synthetic fuel per year beginning 2016.

Last year the Secretary of the Air Force directed Air Force Materiel Command to take on a project to procure synthetic fuel, static ground test the fuel on engine test stands at the Oklahoma City Air Logistics Center at Tinker AFB, Oklahoma City, Oklahoma, and, if ground tests were successful, conduct an aviation flight demonstration at the Air

Force Flight Test Center, Edwards Air Force Base, California. To ensure maximum crew safety in the first US military jet aircraft powered by domestically manufactured synthetic liquid hydrocarbons, the test was conducted using a 50/50 blend of conventional crude oil refined jet fuel and a synthetically manufactured product. The first three flights were arranged for safety purposes so that only a single pod of two engines were powered by the SynFuel blend. The remaining six engines of the aircraft used conventional crude oil refined jet fuel.

The initial flight took place on September 19, 2006, and there have been a total of four flight tests, the most recent occurring on December 15, 2006. The last flight in the test series was flown by the Commander of the Air Force Flight Test Center with all eight engines fueled by the SynFuel blend, thus fully demonstrating the feasibility of using synthetic fuel for military aviation use.

In January, the jet was flown to Minot AFB, North Dakota for a series of cold weather engine starting tests. Those tests have been completed.

The jet was returned to the Air Force Flight Test Center, Edwards AFB, California, and the jet was engines removed and disassembled for inspection. The inspections have confirmed that there are no deleterious effects of using a Synthetic blend jet fuel in military aircraft. On August 8, 2007 the Secretary of the Air Force and the team responsible for the testing and certification of the fuel and aircraft signed a certificate fully authorizing the use of a synthetic fuel-blend in the B-52.

This aviation flight demonstration was the first step towards achieving the Air Force's goal. More flight-testing and airworthiness certification of the fuel is required to meet the Air Force goal of certifying the entire inventory of aircraft for operations with a Synthetic Fuel-blend by early 2011.

The Air Force established a Program Management Office for the Synthetic Fuel program on August 20<sup>th</sup> of this year and it is now taking the work of our scientists and engineers on the B-52 and using it to create a process to expedite the certification of the remainder of the fleet.

Following the successful conclusion of the B-52 certification the Air Force will begin testing the C-17 and the B-1 engine this Fall. The C-17 was chosen because its high-bypass engines are derivatives of the engines on a Boeing 757. In this respect, the testing will coincide with the work being done by the engine manufacturers with the commercial airline industry. The B-1 engine tests will be conducted this November and the work will focus on the augmenters and afterburners that will be critical in determining how synthetic fuel will operate in fighter aircraft. The fuel for tests this year was awarded to Shell Houston and we expect 281,000 gallons of synthetic fuel to be delivered later this week. We are excited about the testing and certification program for the Air Force fleet and as we move forward we will continue to share the information we develop with the Army and Navy.

We know we cannot accomplish our vision without the full support and cooperation of industry, and specifically with respect to aviation operations, without the support of the Federal Aviation Administration (FAA). We have partnered with the industry's Commercial Aviation Alternative Fuels Initiative (CAAFI) throughout our planning and flight testing. We continue to work with CAAFI, the engine manufacturers, the Air Transport Association, the Airports Council International – North America, and the Aerospace Industries Association, and the FAA. The collective goal of these meetings is to ensure we build a road map to early and successful adoption of SynFuels for the commercial aviation transportation sector.

To better understand the industry, we have undertaken two additional efforts:

-- First, at the request of the US Navy and the US Air Force, the Defense Logistics Agency conducted an extensive SynFuels market survey through a Request for Information (RFI). The results of this RFI have given us the confidence to know that as we certify our aircraft for use of SynFuels, a US manufacturing capacity will evolve by the next decade.

-- Secondly, we have partnered have funded a limited study with the Department of Energy and the Environmental Protection Agency in an effort to develop a better understanding of quantify the technical, environmental, and economic issues of one limited portion of the synthetic fuels area: the addition of biomass to the coal feedstock to further reduce CO2 emissions.

On a technical note, SynFuels manufactured by the Fisher-Tropsch process have greatly reduced levels of sulfur compounds (SOx) and very little particulate matter when operated in a modern gas turbine engine.

The Air Force recognizes there is an environmental challenge with carbon management (green house gas emissions) associated with the production and use of SynFuels. The Air Force believes the challenge can and should be overcome with the new technology currently being designed and developed in government laboratories and industry today. The Air Force plans to source its supply of domestically produced synthetic aviation fuel with producers who substantially capture and reuse or reform the CO2 to make it a viable product for future use. This also will result in a product that can be sold and will further reduce the cost of CTL fuels.

The Air Force is working with DOE to study the addition of biomass to the coal feedstock to further reduce CO2 emissions. This effort is expected to provide useful

information on the production of a potentially cleaner domestic coal with domestic biomass that has the potential to reduce CO2 emissions far below current oil refineries in the United States.

One day after the Air Force had certified the fleet, Secretary Wynne was once again walking among the rows of fighter jets and bombers and he meets a developer of synthetic fuel, and the developer asks Secretary Wynne "Is this heaven?" And Secretary Wynne responds, "No, it's Iowa."

Senator Grassley, the Air Force appreciates the opportunity to provide an overview of our energy initiatives and the testing and certifying of synthetic aviation fuels in our aircraft fleet. I look forward to answering your questions at this time.





**For release only by the  
Senate Committee on Finance  
August 27, 2007**

**RENEWABLE ENERGY AND RURAL DEVELOPMENT:  
LOGISTICAL ISSUES**

**Statement of Thomas C. Dorr, Under Secretary  
before the Senate Finance Committee**

**Dubuque, Iowa Field Hearing  
August 27, 2007**

Mr. Chairman, it is a distinct pleasure for me to appear today to discuss logistical issues related to the build out of renewable energy. I commend the Senate Finance Committee for its interest in this topic, and I would like especially to thank the Dubuque Regional Airport for its leadership in advancing the discussion of these very important issues.

I am mindful that how one frames an issue can strongly influence one's conclusions. The logistical issues surrounding the build out of renewable energy, although challenging, ought not to be considered solely as constraints or obstacles. Every problem is also an opportunity. It is, for example, a truism of the California Gold Rush that most of the money was made, not by the miners themselves, but rather by the merchants and shippers who supplied the miners -- and built much of 19<sup>th</sup> century California in the process.

So too with renewable energy. Fulfilling the potential of conventional ethanol, cellulosic ethanol, biodiesel, wind, solar, and geothermal will involve major investments in new

infrastructure as well as new distribution and marketing systems. Much of this will occur in rural areas. There are business opportunities at every point in the value chain.

Our objective at USDA Rural Development is to ensure that rural communities, business owners, investors, and workers participate fully in these opportunities. We recognize that problems and constraints are also opportunities in search of solutions. USDA Rural Development administers over 40 programs with a current combined portfolio in excess of \$97 billion. Many of our business and utilities programs are already directly involved with renewable energy development. Our community facilities programs are involved as well with related infrastructure such as industrial parks, rail spurs, and airports. Across all mission areas, we recognize that investing in infrastructure provides a solid foundation from which to grow an industry that is sustainable and beneficial to all Americans.

In short, reducing America's dependence on imported oil and accelerating the development of clean, renewable, domestically produced energy are high priorities for the Administration and USDA Rural Development. We are eager to explore partnerships with both public and private entities active in this area and we anticipate that USDA Rural Development's investment in renewable energy will continue to grow in the years ahead.

This decade is clearly a turning point that will define the history of our nation's commitment to renewable energy development for future generations. The rapid growth of renewables in recent years has been driven both by higher costs for oil and natural gas

and by aggressive policy leadership from the Administration and Congress. The results have been impressive. Since 2000:

- Installed wind energy capacity in the United States has quadrupled. The U.S. led the world in new capacity in both 2005 and 2006 and is on track to do so again this year.
- Ethanol production has tripled, increasing from 1.6 billion to almost 4.9 billion gallons last year and capacity will double again in the next two years. We are on track to build out a corn ethanol capacity in excess of 12 billion gallons a year. Some estimates of future production run sharply higher.
- Biodiesel production has risen from 2 million to 246 million gallons last year. USDA currently projects production of 379 million gallons in 2007 rising to 680 million gallons in 2010-2011.
- Cellulosic ethanol shows great promise. Earlier this year the Department of Energy announced the availability of up to \$200 million for the development of cellulosic biorefineries at ten percent of commercial scale over the next five years (subject to appropriation). DOE also announced up to \$385 million (subject to appropriations) for six cellulosic ethanol biorefineries over the next four years. In addition, the President has proposed an additional estimated \$2.1 billion for loan guarantees over 10 years for cellulosic ethanol projects in rural areas, which will

advance the development of cellulosic ethanol production as part of the 2007 Farm Bill.

- Solar power is increasingly competitive for off-grid applications. While costs must still decline significantly before we see large scale utility applications, the progress in the labs continues to be encouraging.

Renewable energy is still building out from a very low base -- it accounts for about six percent of total U.S. energy use -- so the logistical impacts of these developments has been limited. As these growth curves are sustained, however, logistical considerations are likely to become more acute -- and part of our challenge is ensuring the structure is in place to meet the needs of consumers.

Large scale wind and solar power, for example, would be expedited by the permitting of new transmission corridors to facilitate inter-regional power transfers, and state level interconnection standards. USDA Rural Development is working with the rural electric cooperatives to anticipate these needs and ensure that adequate funding is available. The permitting and rights of way issues, however, are likely to pose an ongoing challenge to state and local authorities.

The logistical issues associated with biofuels may appear even more daunting. Biofuels production can involve the physical transport of large quantities of bulk commodities. As production grows, this may prompt the need to reevaluate the fuel transport system.

The Agricultural Marketing Service is also expected in the near future to release a detailed analysis of these matters. Briefly, however, the following considerations should be noted:

- The current distribution system for liquid fuels runs largely from ports of entry and a limited number of mostly coastal refineries to dispersed destinations around the country. Biofuels reverse the flow. Dispersed feedstocks will be gathered across rural America. Due to transportation costs, biorefineries are typically located within 50 miles of feedstocks, so the refining base will be distributed as well. Products will then ultimately move from the heartland to the coasts, where 80 percent of the nation's population lives. This will require major investment in new infrastructure.
- U.S. ethanol production continues to increase rapidly. Production in 2007 (Jan.-May) totaled 2.5 billion gallons, 32 percent higher than the same period last year. USDA anticipates production of 6.5 billion gallons over the full year.
- As of August 1, 2007, there were 124 ethanol plants in production with an additional 83 plants under construction. When these are completed, total U.S. production capacity will total 12.9 billion gallons, a roughly eight-fold increase since the beginning of the decade.

- Railroads currently haul 60 percent of the nation's ethanol; trucks 30 percent; and barges 10 percent. In addition, trucks deliver most of the corn to biorefineries. The railroad, trucking, and barge industry are already strained to meet demand and the pressure is growing.
- Rail freight is forecast to increase from 1,879 million tons in 2002 to 3,525 million tons by 2035, an increase of nearly 88 percent. Truck freight is forecast to almost double from 2002 to 2020, while driver shortages are projected to reach 219,000 by 2015. Accelerated development of biofuels will add to the strain.
- The President's 20 in 10 plan calls for a new mandatory fuel standard, requiring the equivalent of 35 billion gallons of renewable and alternative fuels in 2017. The U.S. Senate has passed legislation calling for a 36 billion gallon standard by 2022.
- Cellulosic ethanol will also involve the collection, storage, and transport of large quantities of new feedstocks. These may include corn stover, wheat straw, switchgrass, forest waste, recycled urban materials, and other biomass. This could require significant new transportation and storage capacity, much of it in areas not now involved in biofuels production.

- The Departments of Agriculture, Energy, and Transportation are jointly considering the current and future transportation challenges posed by the growing demand for ethanol and other biofuels.
- Finally, ethanol is not currently moved by pipeline although research continues in this area. Pipeline transport, when it becomes feasible, will alleviate the pressure on other modes of transportation. It will also, however, require large-scale construction of new infrastructure and the resolution of significant permitting and rights of way issues by numerous federal and state agencies.

None of these problems are insoluble, and all of them pose opportunity for communities, businesses, and entrepreneurs. For USDA Rural Development, this is a high priority. From Fiscal Year 2001 through Fiscal Year 2006, we have already invested over \$480 million in more than 1,100 renewable energy and energy efficiency projects ranging from windfarms and ethanol plants to anaerobic digesters and solar installations. Ten separate USDA Rural Development business, cooperative, and utilities programs have contributed to this effort. As the buildout of renewable energy continues, while being cognizant of issues regarding overbuild and balancing supply v. demand issues with current needs, we anticipate that infrastructure investments will become an increasing part of our portfolio:

- Our business and cooperative programs stand ready to assist rural entrepreneurs in seizing opportunities at any point in the value chain. We offer a wide range of grant, loan, and loan guarantee programs that can be tailored to specific situations.

We provide technical support to new entrepreneurs. We are also working to develop business and investment models that facilitate the aggregation of local capital and enhance ownership opportunities in rural communities.

- Our utilities programs can assist in providing the water, power, and broadband infrastructure needed by new industrial development in rural areas. They will also continue to work with the rural utilities to enhance the grid and accommodate the integration of distributed power generation into legacy systems.
- Our community facilities programs can assist regional, state, and municipal authorities in a wide range of infrastructure projects. These might include development of industrial parks, rail spurs, airport expansions, runway strengthening and extensions, and new hangars.

Earlier this year, this Administration proposed a comprehensive Farm Bill that included several renewable energy initiatives that would provide funding for the next ten years. If enacted, USDA Rural Development will be able to provide an estimated \$2.1 billion over 10 years in Renewable Energy and Energy Efficiency guaranteed loans for cellulosic ethanol projects in rural areas; \$500 million in the Renewable Energy and Energy Efficiency grants; and \$150 million in Biomass Research and Development grants. This is a very substantial increase in USDA Rural Development's role in enhancing America's energy security. USDA continues to work with other Federal partners and explore innovative ways to maximize renewable energy opportunities.

In closing, we recognize that renewable energy has become a major driver of the rural economy. Indeed, it may be the greatest new opportunity for investment, jobs, and wealth creation in rural America in our lifetimes, and we are committed to supporting rural communities, businesses, and entrepreneurs in seizing the opportunity. Thank you.

*United States Senate*  
*Committee on Finance*



*Sen. Chuck Grassley · Iowa*  
*Ranking Member*

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Opening Statement of Senator Chuck Grassley  
Senate Committee on Finance Hearing  
“Airfields and Alternative Fuels: Exploring Rural America’s Transportation Infrastructure”  
Monday, August 27, 2007

I am very happy to be in Dubuque today, and would like to extend my gratitude to the City of Dubuque and Dubuque Regional Airport for hosting this hearing. I am always excited to highlight the great things that are happening in Iowa. In that spirit I would like to thank the Rentech Energy Midwest Corporation for the tour of their facility in East Dubuque given to members of the Finance Committee staff and others yesterday. Rentech is in the process of converting their 830-ton per day fertilizer plant from a natural gas facility into a coal and biomass gasification facility which will allow them to produce alternative fuels, nitrogen fertilizers, and electricity. This is very important for many reasons. As the U.S. becomes more dependent on biofuels, we will become more dependent on the fertilizer farmers use to grow crops. Additionally, the fuel produced at this facility will be able to be used in any current engine that runs on conventional diesel fuel and as our witnesses will explain, it could be used for any plane that flies on jet fuel.

Today’s hearing will be building on previous hearings we have had at the Finance Committee in Washington, D.C., this year. Appearing earlier as a witness was Rentech Energy Midwest Corporation president John Diesch who spoke in greater detail about Rentech’s alternative fuel goals during a Senate Finance Committee subcommittee hearing in April of this year, and I ask unanimous consent that his testimony from that hearing be printed in the record.

In addition to focusing on the infrastructure required to produce alternative fuels, this hearing’s other purpose is to draw attention to the unique issues faced by rural airports as they work to provide service to people and businesses in their regions. Access to air transportation is a very important variable in the calculation of any area’s economic health. Rural areas in particular tend to be underserved in this regard. Sometime I wonder if the so-called elite back in Washington realize that most of America is rural, and that is why I wanted to transplant a piece of official Washington to real America by holding a hearing in this hangar. And, I might add, on airport grounds surrounded by a cornfield – the makings of yet another alternative fuel of the future.

We may be talking about rural issues, but access to renewable fuels and reliable transportation are ultimately important for all Americans regardless of where they live. The Finance Committee is at a cross roads. Within the next two months, the committee will be responsible for the re-authorization of the Airport and Airway Trust Fund, the tax provisions of the farm bill, and the alternative fuels

provisions in the energy bill. The committee will have the chance to influence the future of aviation policy, and much of that future will be discussed today at this hearing.

America needs energy security, and rural America is willing to take on that responsibility. It will be our fields that grow the crops and our businesses that invest in technology for the next generation. The importance of these issues is matched by the quality of the panel we have before us today. And I know the interest in these issues is shared by Senator Max Baucus, the chairman of the Finance committee, and though he's unable to join us today, his written statement for the record will be available. Leighton Quon from his staff will be working with us today in this hearing.

First we will hear from Mr. Kevin Billings, Deputy Assistant Secretary of the Air Force for Environment, Safety and Occupational Health. Mr. Billings will discuss the Air Force's commitment to alternative fuels and its current plans to fully certify all of its fleet -- both ground and air -- for alternative fuels to include synthetic jet fuel. Where others have talked, the Air Force has taken incredible action in working to develop a fleet that will be able to fly on alternative jet fuel and drive on renewable fuels. The Air Force leadership is helping to drive an entire movement toward the use of alternative jet fuel throughout aviation.

Next we will hear from Mr. Carl O. Bauer, Director of the U.S. Energy Department's National Energy Technology Laboratory. Mr. Bauer will discuss the important work being done by his laboratory on coal and biomass gasification. If we are going to reduce reliance on foreign sources of fuel, we will need to utilize our domestic sources of fuel. One source of fuel we have in great abundance is coal. Despite a reputation of being dirty and a source of pollution, the work being done by Mr. Bauer and others to combine biomass like Iowa switchgrass with coal in gasification technology will help turn coal into a clean energy source for the future.

Next we will hear from USDA Under Secretary for Rural Development Thomas Dorr. I also want to mention that Mr. Dorr is from Marcus, Iowa, so we know he understands the issues that impact rural areas. Mr. Dorr will discuss infrastructure issues in producing and transporting alternative fuels, the infrastructure requirements of the industries that develop and produce alternative fuels, and USDA Rural Development's commitment to community facilities to complement that growth, such as airports and industrial parks.

Mr. Bruce Heine of Magellan Midstream Partners will discuss issues involved in transporting alternative fuels. Magellan specializes in the transportation, storage, and distribution of refined petroleum products, and distributes most of the fuel in this area. It will not matter how much alternative fuel we produce if we are not able to deliver it to consumers on both the East and the West coasts in an efficient and reliable way. Magellan continues to be a trail blazer in the incorporation of renewable fuels into the national fuel delivery system.

Mr. Steven Accinelli is the Chairperson of the Dubuque Regional Airport Commission, as well as the Director of Aviation Programs for the University of Dubuque. Mr. Accinelli will talk about the issues facing aviation in rural America and the continuing challenges to develop and enhance service to rural or underserved areas by building access to both commercial flight and general aviation. In addition, he has the unique responsibility for the academic bachelor degrees and flight training of over 200 students and has the opportunity to influence our young pilots of the future.

Our final witness is Dr. Bruce Holmes, Director of Aeronautics Research for the DayJet Corporation. Formerly NASA's chief strategist, Dr. Holmes is helping DayJet enact an innovative business plan that will hopefully bring jet service transportation options to almost anyone's front door. In addition, Dr. Holmes is helping his company lead the way to the sweeping changes planned for air traffic control and the implementation of the NextGen technologies, and their interest in helping the nation's airspace to become cleaner with fuel efficient fleets and investments in alternative fuel technologies.

Thank you all for being here to help us with these vitally important issues. Rural America has the ability to reduce our dependence on foreign sources of fuel, but we have to provide the necessary infrastructure while ensuring that businesses have the transportation options necessary to access rural areas. Anyone who is truly concerned about the environment or our reliance on foreign sources of fuel must pay attention to these issues.

**SENATE COMMITTEE ON FINANCE**  
**SUBCOMMITTEE ON ENERGY, NATURAL RESOURCES AND**  
**INFRASTRUCTURE**

**HEARING ON COAL: A CLEAN FUTURE**

April 26, 2007

Written Statement of  
John Diesch  
President of Rentech Energy Midwest Corporation

Thank you Chairman Bingaman, Senator Thomas and distinguished Committee members, I'm John Diesch, President of Rentech Energy Midwest Corporation (REMC), a subsidiary of Rentech. Rentech is the leading US firm developing facilities capable of commercial scale production of Fischer Tropsch fuels. These are ultra-clean diesel and jet fuels that can be made from any number of hydrocarbon rich resources, including coal, petroleum coke, natural gas, biomass and other abundant domestic sources.

This is a sample of our diesel – you will notice that it is virtually clear. It is extremely low in particulates and sulfur emissions. You can use Rentech diesel in any current engine that runs on conventional diesel – in trucks, buses, barges, locomotives or diesel cars. Last year, the Air Force flew a B52 bomber on the jet fuel version of FT. Our fuel produces all of the transportation energy of conventional fuels, with several major advantages:

- It can be made from abundant domestic natural resources, lessening our dependence on imported oil.
- It runs cleaner than conventional fuels from petroleum, producing slightly less greenhouse emissions than conventional diesel when used in the same engines. When compared to similar vehicles with gasoline internal combustion engines, there is about a 25 percent reduction in greenhouse gas emissions.
- For other regulated criteria emissions – SO<sub>x</sub>, NO<sub>x</sub>, and particulates – using our fuels cuts emissions by up to half over conventional diesel.
- Rentech diesel can also be stored 5 to 10 times longer than oil-derived diesel, and it is biodegradable, making it ideal for strategic reserves.

And let me state right up front that, with the proper manufacturing configurations and appropriate sequestering, we can manufacture our fuel so that the total production of greenhouse gases – from manufacturing AND vehicle use – is less than the wells to wheels emissions of conventional diesel. And that would be a major improvement over gasoline.

While the potential of this fuel is still in the early stages in the US, the technology for making this fuel is over 70 years old. Large scale manufacturing plants are operating in South Africa, Qatar, Malaysia, and under construction in a number of other countries including China, which is aggressively developing a CTL industry to meet its growing transportation fuel needs. In the US, Rentech holds over 20 patents from its more than 25 years of experience refining the process, and we expect to have the first commercial scale production facility operating in the US by 2010.

That first plant will be the conversion of the fertilizer plant in East Dubuque, Illinois that I have managed for nine years. Currently, we make nitrogen fertilizer and urea products for the local market, primarily serving farmers in Illinois, Iowa and Wisconsin within a 200 mile radius of the plant. Most fertilizer plants in the US are now struggling because of the sustained high cost of natural gas, the primary feedstock for making fertilizer products. In fact, over half of the US production of fertilizer has shut down in the last seven years, moving overseas where natural gas prices are significantly cheaper and more stable.

Let me demonstrate the clear and convincing economics. The East Dubuque plant uses 31,800 MMBtu per day, enough gas to heat a city of 100,000 homes. A ten cent increase in the price of natural gas is \$1,000,000 per year in additional operating cost. This plant would have shut down three years ago if it was not for the conversion to clean coal technology.

So why add a fuel plant to a fertilizer plant? Because many of the processes are shared: the gasification of coal, the production of synthesis gas, the conversion of that synthesis gas into other useful products. Depending on the configuration and the additional equipment added, these plants can produce various combinations of fuels, fertilizers, electricity, and other useful manufacturing and consumer products.

Right now, we are in the final stages of design work at East Dubuque. We hope to break ground in just a matter of months, and it will take about 3 years to convert the existing fertilizer manufacturing process to a coal-fed gasification system and add an FT plant to also produce fuels. After conversion, we will increase ammonia production capability from 830 tons per day to 1,000 tons per day while producing 1,200 to 2,000 barrels per day of ultra clean FT fuels, with the possibility of ramping up to over 5,000 barrels per day. Our construction schedule anticipates the plant operating in the new configuration by 2010, making it the first commercial scale plant in the US producing these fuels

The conversion will take an investment approaching 1 billion dollars. It will nearly double the number of full-time high-paying union jobs currently at the plant, and employ nearly 1,000 construction workers at its peak. REMC is the highest paying employer in the Greater Dubuque area.

Rentech is doing more than just building a first-of-its-kind plant, saving jobs, saving an industry and creating a new domestic fuel source. We are a company that is also committed to doing what is right. That is why we have been examining the ways that we

can reduce the greenhouse gas footprint of these plants. Using coal as a primary feedstock has many positive attributes – it allows us to sustain the domestic manufacture of fertilizer, it creates additional jobs in the American coal industry, and it is an abundant local resource being utilized effectively and cleanly. At the same time, using coal does create more greenhouse gases – but the great advantage of the technology is that those greenhouse gases can be contained during manufacture.

Fertilizer plants capture and sequester carbon dioxide in their products. At East Dubuque we use some of the carbon to manufacture our UREA and fertilizer products, where it helps fuel the growth of the food crops that dominate our region of the Midwest, most notably corn. Next, we capture additional CO<sub>2</sub> produced during manufacturing, clean it and compress it, and sell it to the food and beverage industry. We will continue with our capture program after the conversion, but the extent of those carbon solutions are unique to East Dubuque and the co-production of fertilizer and FT fuels.

For our future proposed projects, Rentech's engineers are working on recycling configurations that maximize the capture of CO<sub>2</sub> during manufacturing. Our second proposed plant, in Natchez, Mississippi, is near oil fields where Enhanced Oil Recovery would allow productive use and sequestration of all of the CO<sub>2</sub> captured. The potential for carbon capture and sequestration is also a critical factor in our consideration of the potential of other future sites. Rentech is focusing our development efforts on projects with realistic CO<sub>2</sub> capture and sequestration opportunities.

As capture rates approach 80-85 percent, the total wells-to-wheels emissions of our diesel is comparable to conventional diesel – and a marked improvement over gasoline. Remember – in usage, our diesel actually emits less carbon dioxide per mile than conventional diesel. And there are early projections that mixing in 10 percent biomass with the feedstock could result in even more noticeable reductions in greenhouse gases.

A couple of quick statistics – if every vehicle on the road today were using a diesel engine, run on FT fuel manufactured with 80 percent carbon capture and 10 percent biomass, we would reduce the transportation emissions from those vehicles by 5-6 percent over conventional diesel – and 30 percent or more over gasoline. If we switched to diesel hybrid engines – using technologies available today, not waiting to be invented – we could reduce greenhouse gas emissions by well over half in those same vehicles compared to using gasoline engines. And let me be clear – I am talking total emissions – wells to wheels. That is the potential of these fuels and this process.

The investment that is required to make good on this promise though, is tremendous. I mentioned already that it will cost nearly a billion dollars to convert the East Dubuque fertilizer plant. Plants with a bigger production capacity built from scratch would cost even more. And the additional costs to ensure that we are optimizing carbon capture and sequestration can be significant as well.

While Rentech is developing our plants – at East Dubuque and beyond – primarily with private capital investments, active support from both the state and federal governments is

critical to developing this industry. We were able to move East Dubuque forward because of initial feasibility study help from the State of Illinois. As we developed potential financing packages for the conversion to industrial gasification, we hoped to use the provisions of EPAct 2005, including the 48B investment tax credit.

As you know, however, the 48B program was capped at \$350 million last year. And it was oversubscribed – dramatically. Applications totaled \$2.7 billion. Unfortunately, that meant that a lot of great applications, like ours, didn't get any funding at all. Although it is not completely clear because some of the awards were kept secret, it seems that most of the funding went to traditional applications – not the sort of technological advances that could represent breakthrough new gasification industries for the US.

From that experience, we draw two complementary recommendations – first, raise the cap on the credit so that more projects, especially those that could revolutionize the industry, can be funded. We strongly recommend a significant increase of at least double or more. Second, specifically clarify that gasification tied to FT is a permissible use. In fact, we would suggest that the Congress consider designating a specific portion of the industrial gasification tax credit to FT development.

One of the most important potential users of our diesel and jet fuels is the U.S. military. The strategic advantages to a stably-priced domestic source of fuel that has all of the built in advantages of FT – storage life, biodegradability, and reduced emissions – are obvious. In fact, some of the biggest reductions in potential emissions – both greenhouse gases as well as regulated criteria emissions – have been noted in tests in military vehicles. We appreciate Congressional support for longer-term military contracting authority that would allow for the kind of stable investment climate to start up these plants.

Next, we must recognize that finding appropriate means to capture and sequester greenhouse gases is a critical challenge for every major heavy industry in our country and indeed around the world. We have two additional recommendations that could help ensure that the United States remains competitive in a carbon-constrained world – and indeed, that our nation leads the way environmentally. First, recognize that advances in carbon sequestration options have applications across a wide range of industries and fund basic research into promising applications. Second, offer incentives for companies – like Rentech – that are taking the lead and including carbon capture and sequestration technologies in their plant designs.

Two tax incentives – an FT-specific variant on 48B and a deduction for the cost of carbon capture and sequestration equipment – paired with longer military contracting authority could set the stage for rapid development of this industry and have far-reaching consequences for our national security. We could more effectively utilize domestic resources. We could reduce our dependence on foreign oil, with all the associated consequences -- diplomatic, economic and military. And we could maintain key industrial sectors in a way that is far more beneficial to the long-term stability of our environment.

And finally, I'd like to throw in one more potential advantage that is unique to what we are doing in East Dubuque. At that plant we are really producing two fuels – one for transportation, the other for our food crops in the form of the fertilizers that are necessary for their growth. As our nation meets the economic and environmental challenges of this new century, we can't afford to lose our independence in either area. So I issue an invitation to each of you and your staffs – anytime you would like to see what we are doing, please come. We are proud of our products, proud of workforce, and proud that we are a good neighbor to the Mississippi River and to our local communities.

Thank you very much for your time this afternoon.

**Testimony by**

Bruce W. Heine,  
Director Government and Media Affairs  
Magellan Midstream Partners

**Before the United States Senate Committee on Finance****Airfields and Alternative Fuels: Exploring Rural America's  
Transportation Infrastructure**

August 27, 2007

Good morning Ranking Member Grassley, members and staff of the Committee. Thank you for inviting Magellan to testify on the important subject of alternative fuels and transportation infrastructure. Magellan owns and operates the nation's longest refined product pipeline system along with eighty-one petroleum distribution terminals in twenty-two states. In Iowa, we have distribution terminals here in Dubuque, Des Moines, Ft. Dodge, Iowa City, Sioux City, Waterloo, Milford and Mason City from which we distribute the majority of fuel consumed in the state.

Our nation's demand for liquid energy continues to grow. As domestic and international refineries expand to produce more gasoline, diesel and jet fuel, domestic pipeline infrastructure needs to expand to accommodate the growth. As ethanol and biodiesel production continues to grow, pipeline companies like Magellan are exploring technical solutions to current barriers which may lead to commercial opportunities to transport ethanol and biodiesel blended fuels via existing pipelines. In the meanwhile, we are continuing to invest in traditional ethanol and biodiesel storage and blending infrastructure at our terminals. Today, I will focus my remarks on (1) biofuels and pipelines, (2) biodiesel blending, (3) managing the integrity of Ultra Low Sulfur Diesel and (4) the importance of energy infrastructure publicly traded partnerships.

**Biofuels and Pipelines**

We do not transport ethanol, ethanol blends, biodiesel or biodiesel blends in our multi-products pipeline system today. However, pipelines are an efficient, safe, economic and

reliable way to transport large volumes of liquid fuels. To achieve the Senate's biofuels goal in HR6, opportunities may develop to transport ethanol or ethanol-blended gasoline via pipeline in the United States. However, there are a number of operational, technical and economic issues associated with the potential transportation of ethanol in a multi-products system pipeline. These include the practices and equipment to minimize water content and impurities, compatibility of existing seals and gaskets used in the valves and pumps and the potential for "stress corrosion cracking" of pipelines and tanks. Substantial research into the causes of and solutions for these items, particularly the stress corrosion cracking issue, will be necessary before we are comfortable in considering ethanol transportation by pipeline.

It is our responsibility to prevent pipeline leaks and to protect the environment. Under the leadership of the Association of Oil Pipelines, our industry is currently studying the technical issues associated with the transportation of ethanol blends via pipeline. In addition, we need your assistance in determining the cause and solution to stress corrosion cracking. To this end, we urge the passage of provisions in both the House and Senate Energy bills which provide funding to study the technical, siting, regulatory and financial issues associated with transportation of ethanol via pipeline.

It is conceivable that limited opportunities to transport 10% ethanol blends may prove to be technically feasible due to the low concentration of ethanol in the product. However, we believe the most likely opportunity to transport fuel grade ethanol will be in a dedicated pipeline built for that specific purpose. This position is based on the assumption that the solutions to the technical issues described earlier may be cost prohibitive with an existing multi-products pipeline.

We face a number of commercial issues when considering a dedicated pipeline for the transportation of ethanol. A line from the Midwest to the East Coast could be a billion dollar or more project. Key variables in a project of this nature include (1) the reliable volume of ethanol that would be required on the line to provide an economic business case, (2) aggregation systems and connections to plants, (3) delivery points and (4)

market dynamics. Since we have not conducted a comprehensive study, we do not yet have answers to these important questions.

#### **Conversion to Ultra Low Sulfur Diesel (ULSD)**

The increased supply and demand for ULSD for on and off road purposes has allowed us to discontinue transporting and storing High Sulfur (500ppm) diesel at a number of our terminals. During our successful conversion to ULSD, we took a number of steps to protect the integrity of ULSD by separating it from jet fuel which can contain as much as 2000ppm sulfur.

#### **Pipeline Services**

Generally, we prefer fewer grades of fuel to transport on the pipeline system. The greater the “fungibility”, the greater the efficiencies which helps to keep costs low for our shippers. We operate an “open-stock” system for no-lead gasoline and ULSD. This allows us to receive barrels from a shipper in Houston and simultaneously give the shipper access to barrels in Des Moines. We do, however, serve several markets which offer or require “boutique fuels”...e.g. Kansas City and Tulsa and we transport several segregated, lower volume products.

We are in the transportation and service business and we strive to meet our shipper’s needs. If a shipper asked us to transport an alternative type of jet fuel which met Magellan’s and ASTM specifications, we would assess commercial and operational variables. For example, we would assess the (1) volume and available line space, (2) special handling and compatibility requirements and (3) our ability to store the product at an origin and destination terminal. We are constantly evaluating the product grades on our system to meet shipper expectations.

#### **Energy Infrastructure Publicly Traded Partnerships**

A number of pipeline companies, like Magellan, are structured as publicly traded partnerships (PTPs). For the past twenty years, partnership tax treatment has been available to PTPs earning at least 90% “qualifying income”, that is interest, dividends,

real estate rents, capital gains, commodities and income from “natural resource activities”. An example of a natural resource activity is the transportation of gasoline, diesel and jet fuel via pipeline.

Congress created this tax structure for those entities interested in raising and investing capital for large scale energy infrastructure projects. Magellan is a perfect example of a PTP which has made significant investments in transportation infrastructure for refined products and terminal distribution infrastructure for renewable fuels.

When Congress amended the IRS code in 1987 and implemented the 90% income requirement, income from the transportation of ethanol blends via pipeline when feasible was not included as qualifying income. In 1987, U.S. ethanol production was 46,000 barrels per day. Today, U.S. ethanol production exceeds 419,000 barrels per day. Congress did not envision the need to transport ethanol via pipeline, nor the possibility that ethanol blends could be transported via pipeline in the near future. If we can resolve certain technical issues, it may be practical and economical to transport ethanol blends via pipeline in the short-term. The successful transportation of ethanol blends via pipeline would virtually eliminate the need for costly rail offloading infrastructure in developing ethanol markets. However, under the existing IRS code the revenue generated from the transportation and storage of an ethanol blended fuel via pipeline is not qualifying income although revenue generated from blending ethanol into gasoline would be qualifying income.

We believe the Finance Committee has taken a positive step by passing the Energy Advancement and Investment Act of 2007 tax amendments which would treat income from the transportation of ethanol blends via pipeline as qualifying income. The proposed change simply allows the income generated from the transportation of non-petroleum based fuels by pipeline to be included in “qualifying income” for PTPs. The provision would not create any new class of business. Rather, the provision would allow existing PTPs to transport the ethanol blended fuels across the country once the technology allowing such transportation is achieved.

Lastly, the Committee's "Energy Advancement and Investment Act of 2007" contains provisions to alter the IRS code for biodiesel and biodiesel mixtures. One proposal adds qualified biodiesel mixtures to the definition of taxable fuel as a type of diesel fuel. We support the Committee's approach.

Thank you again for the opportunity to comment on these important subjects and I would be pleased to answer questions.

**Statement of Dr. Bruce J. Holmes,  
Chief Strategist – NextGen Systems, DayJet Corporation**  
Before the Senate Committee on Finance, Field Hearing on  
“Airfields and Alternative Fuels: Exploring Rural America’s Transportation  
Infrastructure”  
Monday, August 27, 2007, Dubuque, Iowa

Good morning Senator Grassley. Thank you for the opportunity to testify today regarding the work we are doing together with the Federal Aviation Administration (FAA), the Joint Planning and Development Office (JPDO), National Aeronautics and Space Administration (NASA), Transportation Security Administration (TSA), and Eclipse Aviation to develop and deploy the world’s first commercial “per-seat, on-demand” regional air transportation service between underserved communities using underutilized small community and regional airports. As you know, communities such as Dubuque stand to be the biggest beneficiaries of revolutionary concepts in air travel, such as ours. We would like to share with you today our business model, our plans to accelerate the implementation of NextGen aviation technologies, and our commitment to work with our suppliers to reduce the energy, carbon, and noise footprints of our operations.

**DayJet’s “Per-Seat, On-Demand” Model-** DayJet’s corporate mission is to make affordable, safe, secure, and direct on-demand jet transportation between secondary markets a commercial reality. In addition to restoring productivity and quality of life for business professionals, our air transportation service will expand local economic development opportunities in the communities we serve.

DayJet will connect smaller communities, metropolitan exurbs and rural areas with a point-to-point service. With missions in the 100 to 600 statute mile range, our short flights will avoid entering Class B air space. Instead we will fly in underutilized air space at flight levels typically in the 18,000ft to 26,000ft range. DayJet plans to fly our fleet of more than 700 Eclipse 500 jets using a two-person crew, meaning we will train and fly with two pilots. We will train our flight crews in a

program that is similar to that of a traditional airline. As a FAA FAR 135 certificated on-demand operator, we choose to train our pilots and maintenance personnel at a level that goes above and beyond minimal requirements. We do the same when it comes to security.

Our value proposition for travelers is in gaining personal command of their time. This means that our customers have greater freedom of choice in where they live, work, learn and play. Our value proposition for communities is in expanding economic opportunities beyond the confines of the hub and spoke airline system. This means that rural and remote communities can participate more fully in the nation's expanding economy and in strengthening their economic position through regional collaboration. Finally our value proposition for the nation's airspace system is in expanding airspace capacity, while mitigating our environmental footprint through technologies as envisioned in the JPDO's Concept of Operations for the NextGen system.

A more complete description of our DayJet "per seat, on-demand" model is attached to our written testimony.

**NextGen Demonstration-** DayJet's investments in Next Generation technology are a factor driving modernization of the National Airspace System (NAS). The FAA estimates that in less than twenty years, air traffic will roughly triple and passengers will double. However, simply tripling the old infrastructure is neither an affordable nor scalable solution. The existing architecture of the airspace is built around technologies developed in the middle of the last century. Therefore, we need to transform and modernize the system, rather than expanding the status quo. Working in partnership with the FAA and leveraging technical research and development by NASA, we have identified key areas in which operational best practices combined with new technology will be implemented. These implementations on our aircraft and in our training maximize safety and operational availability while minimizing our impact on work loads for Air Traffic

Control (ATC). Our investments in on-board technology and in training will allow DayJet to use new Required Navigation Performance (RNP) routes and wide area augmentation system (WAAS) lateral precision vertical (LPV) approaches. We will equip our fleet with Automatic Dependent Surveillance Broadcast (ADS-B) transponders allowing for much improved ground based surveillance. As "ADS-B in" capability becomes available, we expect to reap the benefits of reduced minimum separations and much improved situational awareness. These innovations result in lower costs for all parties while enhancing safety through greater flight precision in the utilization of air space and in a greater variety of weather — all meaningful near term advantages of modernization. These advancements will benefit travelers, industry, government, and the communities served by rural airports.

Attached to this testimony is a white paper outlining the concept for accelerating early adoption of NextGen capabilities.

**Alternative Fuels.** Finally, we believe that the NextGen system is an enabler of the greening of air transportation. As one of the major buyers of aircraft engines, DayJet is working with our suppliers to continue to reduce the energy, carbon, and noise footprints of our operations. As our new industry begins to grow, we look forward to working with our peers in exploring and ultimately implementing changes that affect our industry footprint. As we describe in our NextGen Demonstration plans attached to this testimony, we believe that these new ways of adding capacity to the nation's airspace are green in nature. That is, we believe that the demonstration will document the improvements that are possible. We are developing strategies for use of our aircraft in testing alternative fuels for eventual adoption in our fleet operations. We believe that the concept of NextGen is win-win-win, for travelers, for industry and for the nation's communities.

Senator, this concludes my testimony. I would be happy to answer any questions you may have.

Appendix A: NextGen Demonstration Concept Paper  
Demonstrating and Implementing  
Next Generation Air Transportation System Technologies

A White Paper  
Washington DC  
August 2007

Introduction: Change is in the air – literally. The opportunity for innovation in our nation’s air transportation system is upon us. Why? The Federal Aviation Administration (FAA) estimates that in less than twenty years, air traffic will roughly triple and passengers will double<sup>1</sup>. However, simply tripling the old infrastructure is neither an affordable nor scalable solution. The requirements, and therefore the costs, of air traffic services are highly dependent on the size, speed, equipage, and maneuverability of the aircraft and age of equipage. As the new generation of smaller transportation aircraft enters the fleet, with technologically advanced equipage, they possess greater agility in the airspace, therefore requiring less airspace for spacing, merging, and maneuvering. The existing architecture of the airspace is built around technologies developed in the middle of the last century. Radars locate traffic; ground-based navigation systems guide pilots; and air traffic controllers keep the aircraft apart, assisted by centralized computers. In fact, the FAA expends resources even when directing planes on the ground to the right gate or runway. The good news is that several key innovations in modern aircraft provide new ways to manage the technical and cost issues while safely expanding the nation’s airspace capacity.

The innovations that are now taking flight will bring improvements in transportation-related quality of life and vastly expanded economic opportunities early in the 21<sup>st</sup> century, WHEN.... The “Big When” relates to public policy and private risk. When the public and private sectors collaborate, the needed transformations can emerge. This is precisely the focus of the Joint Planning and Development Office (JPDO), the organization charged by Congress with managing the transformation of the U.S. air transportation system to meet the demands of the 21<sup>st</sup> century. Our focus must include the strategies which will unlock the latent abundance in the nation’s airspace.

Implementing the new technologies that will comprise the next-generation air transportation system (NextGen) provides the means to triple traffic without tripling costs. The companies participating in the Demonstration will be the early adopters of these new technologies. Working together, the Demonstration partners will illustrate the first steps toward that promise of leveraging new technologies to increase air traffic while controlling long-term costs. The demonstration plan outlined below will apply proven approaches in public-private partnering to accelerate these first steps and their outcomes over the coming few

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<sup>1</sup> [http://www.faa.gov/data\\_statistics/aviation/long-range\\_forecasts/media/long06.pdf](http://www.faa.gov/data_statistics/aviation/long-range_forecasts/media/long06.pdf)

years. Innovation through public-private collaboration offers the potential for lower costs and faster implementation of results for both government and industry early in the 21<sup>st</sup> century system.

Deploying the new technologies that will underpin NextGen is a complex effort that need not take until 2025, the year cited as the milestone for completing the transformation of the U.S. air transportation system in JPDO planning. There are steps that can be taken now to evaluate and implement capabilities in the national airspace system that will accelerate transformation in air transportation. This paper outlines early steps proposed for a public-private collaboration to achieve that acceleration. The benefits will accrue to the public, the industry, the government, and to the underserved communities that will be served by the new air taxi industry.

The undertaking involves implementing a set of inter-related technologies and policies, while continuing safe operations within the current system. To ensure that each element of NextGen works well, we need a proving ground – a smaller venue in which to demonstrate these technologies and show that they are effective and scalable. The airports serving the new air taxi markets provide such a venue. This emerging NextGen industry is founded on technologically advanced aircraft, systems, and business models that create a productive and efficient new way to travel. At the same time, this industry will be the proving ground for NextGen technologies – and will leverage foundational NextGen technologies to meet the air transportation needs of underserved communities without burdening the major commercial hub airports.

**The Demonstration:** The planned demonstration will accelerate industry and government deployment of operating capabilities in the national airspace system, starting first in non-competing, under-utilized airspace and airports. The demonstration will establish infrastructure and procedures for on-demand, networked air taxi fleet operations including in non-radar, non-towered airspace environments. The components will include aircraft systems, digital communications systems at airports, and a set of procedures for safe approaches to more runways and spacing and merging of aircraft outside of radar coverage. The technologies include Automatic Dependent Surveillance – Broadcast (ADS-B), Required Navigation Performance (RNP), satellite-based Area Navigation (RNAV), and Lateral Precision with Vertical Guidance (LPV) approach capabilities. As the FAA's EnRoute Automation Modernization (ERAM) and System Wide Information Management (SWIM) deployments unfold, the services provided will be vital to the 4D dynamic trajectory optimization that is possible and important to the early adopters in the air taxi industry. The partners will include the air taxi operators, very light jet (VLJ) and other aircraft manufacturers, avionics vendors, third-party airspace procedure developers, states and local municipalities. The interface with the Department of Transportation (DOT), FAA, and JPDO will be developed as appropriate to meet policy, certification, and regulatory requirements. Inclusion of the operators,

airframe and engine manufacturers, related supply chains and regulators ensures the creation of robust adoption and deployment paths for these new technologies.

The timing of the demonstration will be paced by the increasing availability of equipped aircraft and air traffic management systems over the coming months and years. By mid-2008 the delivery of technologically advanced aircraft specifically outfitted for the demonstration will be underway. In the nearer term, the existing aircraft in the air taxi fleets, the current airspace and airport capabilities form the basis for baseline testing of network performance for on-demand fleets. By 2010, the results of the ongoing demonstration efforts will have produced data that can serve as the basis for accelerating implementation by the government and industry of operating capabilities benefiting both sectors.

The NextGen technologies in the demonstration will begin the transformation from the extant air traffic control (ATC) system and demonstrate the true potential capacity in the nation's airspace. The outcome of the demonstration will illustrate the savings in cost and time for aircraft fleet network operations as compared to current technologies. These savings translate directly into benefits in community noise, carbon emissions, and overall energy consumption. Most importantly, the outcome will also demonstrate the savings to the government providers of air traffic services by incorporating next generation technologies envisioned in the nation's NextGen Air Transportation System vision.

**Public Good:** The following important and desirable goals for our air transportation system are framed by the Joint Planning and Development Office (JPDO) strategies for transformation of the U.S. air transportation system:

- Improved, flexible and more convenient air service
- Less waiting, more air travel choices
- Point-to-point service to cities that are now hard to reach
- Economic development for mid-sized cities
- The very latest innovative technologies to make air travel safer and more convenient
- Achievement of these results through business innovation, with a minimum of government subsidies and a minimum of expenses that must be paid by the taxpayers.

New companies have already begun operating on-demand air taxi networks. This summer, the first NextGen fleet operators will start flying the newest VLJs with two or three passengers per flight, point-to-point, between cities that now offer little or no commercial air service choices. These new VLJ-based services are possible because of new business models enabled by never-before-seen optimization and scheduling software and an array of new technologies that will transform the air transportation system. Other operators have launched on-demand air taxi services using other technologically advanced aircraft with

success. The combination of the new, economical aircraft and the ability to create daily, flexible departures and arrivals “on demand” serves as a proving ground for a variety of concepts that make up “next generation” flight technologies.

NextGen technologies will be the most sweeping change to the way we fly since the current system developed during the 1940s and 1950s. These “transformation” technologies are really a re-architecting of the airspace, airports, and aircraft. Transformation includes such concepts as satellite- and airborne-based digitally communicated flight information; self-spacing and merging; and predictable flight trajectories directly from takeoff to landing. These capabilities will be based on RNP (required navigation performance), Collaborative Decision Making (CDM) technologies, and the emerging ERAM capabilities. The benefits to the public include increased safety, greater choice, more destinations, shorter travel times, greater ease in travel planning. The net effect includes diffusion of service to secondary and rural markets, extending economic opportunity beyond the Interstate off-ramps and hub airports.

The figure below maps the inputs and outcomes of the demonstration. On the left, this figure depicts the terminal and enroute domains, components, and functions that rely on NextGen technologies and operating capabilities. On the right, the outcomes from the demonstration are depicted, in terms of products that enable implementation of the capabilities and the benefits in terms of footprint, are depicted on the right. The footprint elements include infrastructure cost, network performance, energy, emissions, and noise.

**Public-Private Collaboration:** The goals outlined above are achievable because of the early NextGen technologies developed by a group of pioneering companies, the National Aeronautics and Space Administration (NASA), and the FAA, in previous public-private collaboration in research. The current planned demonstration by leaders in the emerging industry is the next logical step leading to broad implementation by industry and government.

The previous public-private collaborations leveraged investments to produce industry-wide acceleration. For example, private industry funded about half of NASA’s Advanced General Aviation Transport Experiments (AGATE) Alliance, the Small Aircraft Transportation System (SATS) Program, and the General Aviation Propulsion (GAP) project. These are significant examples of market-driven innovation flourishing in a heavily regulated industry. Such collaboration provides both the government and the industry with the means to align private sector interests with national interests and public good outcomes.

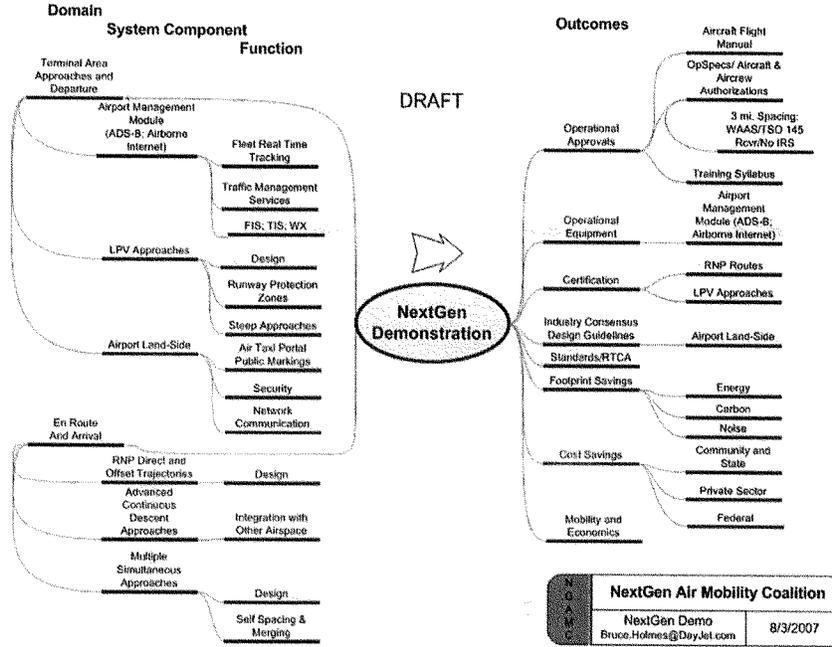


Figure: NextGen Demo Concept Map

NextGen Innovation: Because the existing U.S. air routes operate like railways – as narrow, pre-determined paths in the sky – airspace on popular routes is crowded. Each plane must be separated from the others by carefully defined vertical and horizontal distances. While in certain large metropolitan terminal areas, airspace is indeed scarce, our strategies for the future airspace system must be guided by the concepts of abundance, where such opportunities exist. The challenge lies in accessing the utility of this abundance where it is available, through technologies that advance efficiencies. Since flights by the next generation air taxi industry and nearly all business and general aviation operators will use complementary airspace and airports, they will not impact the increasing congestion in the large hub-and-spoke airport system. But this outcome is only ensured if we tap the capacities that currently lie dormant.

The new operational innovations will require significant investment, including private sector resources. The demonstration plans include exploration of appropriate funding models for design and deployment of the NextGen innovations in the aircraft, airspace and airports. It is vital that the policies affecting resources needed for NextGen technologies, products and operations provide support and incentives for the innovation process.

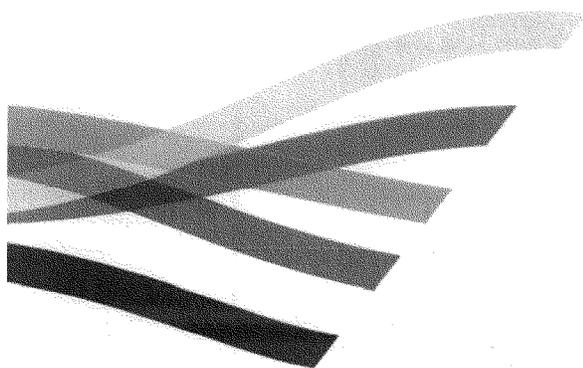
The NextGen improvements include small, efficient and quiet aircraft; advanced instrumentation; satellite-guided flight; trajectory-based airspace management, so planes can take the most direct route; real-time passenger scheduling; and airports that require far less federal, state, and local investment. The supporting technologies are now far along in their development and will be proven first in the emerging V LJ-based air taxi system. These innovations are happening with relatively low government investment through start-up companies working in partnership with far-sighted local communities. This collaboration is a prime example of successful public-private partnerships that place relatively low demands on the government and the taxpayers.

The new air taxi industry will invest their own capital to provide services that will benefit the entire air transport system. These investments will produce new RNP airspace procedures, both enroute and for approaches to airports. For example, for a round-robin flight in marginal weather between Boca Raton, Florida, Valdosta, Georgia, Lakeland, Florida, and returning to Boca Raton, operations would be limited to only one direction on one runway at each airport, even though there are many runways at these airports. This limitation is caused by the fact that traditional instrument approach equipment is too expensive to permit every runway to have electronic guidance for flying approaches in both directions for every runway. This limitation in guidance systems causes unnecessary flight time, fuel burn, carbon emissions, and noise, due to extra maneuvering necessitated by the design of the airspace and procedures. Furthermore, flight along the existing airways, versus a direct route between the two cities would require between 5- and 20-percent additional distance, time and fuel.

One of the leaders in the next generation air taxi industry will operate on routes between Boca, Valdosta, and Lakeland. The company will require the infrastructure for communications, navigation, surveillance, and procedures designed and certified for direct routes and efficient approaches to the airports. The company will benefit from investing in these efficient airspace capabilities and would share the benefits of those investments in the interest of establishing the growth path for their company as well as for the industry. This is the sort of innovation the demonstration can accelerate and that Federal government decision-makers will want to encourage.

**The Bottom Line:** Air transportation in America is at a crucial juncture. Working together, operators, aircraft manufacturers, systems developers, government regulator agencies and municipalities have the opportunity to put into motion the means to access the vast untapped capacity in the nation's airspace. We are at the threshold of the transition from the infrastructure, policies, and operations of the last century toward the innovations that will propel our quality of life and economic opportunity in the 21<sup>st</sup> century. Look up, look forward, but do not look back. Our future relies on the changes that are in the air.

**"Per-Seat, On-Demand" Jet Services**  
How to Keep Air Transportation Moving at the Speed of Business



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*A series of breakthroughs in aviation and computing technologies promise a new age of flight that combines the convenience of corporate jet travel with the availability and affordability of commercial airline service.*

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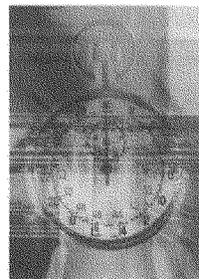
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*"We are heading toward  
an extreme future where  
change occurs much faster  
than any of us realize.  
It's as if time itself is  
on fast-forward."*

Dr. James Canton  
Institute for Global Futures



## Introduction

### It's an Always-Connected, On-Demand World.

Soon, you'll have a jet service that can make your business travel work the same way.

Thanks to the technology revolution of the last decade, business professionals now benefit from a fast and efficient virtual workplace that allows instant access and dissemination of information and ideas anywhere, at any time. Yet, when it comes to the transportation of an increasingly distributed workforce — especially between outlying regional markets — it's apparent that physical mobility has become the bottleneck in today's on-demand, digital economy. As James Fallows, author of *Free Flight*, observes:

"Since at least the early nineties, the trend in most businesses and services has been toward on-demand, always-available products and services that fit themselves to the customer's schedule rather than the reverse. You can make or receive phone calls from almost anywhere. You can get money at any time from any ATM in almost any part of the world, and you can do your banking at 3 a.m. on your home computer rather than queuing up for a teller during bankers' hours. The rising companies of the computing and Internet era in one way or another all made it easier for customers to control and conserve their time. . . . But starting in the nineties, commercial airlines were adding more rigidity than flexibility to the national transportation system. . . . people had to tailor their timing and their travel plans to what the airlines offered, in contrast to what they found with other parts of the modern economy."

### It's About Time

It's time for a new concept in transportation — a concept that will reverse this trend to provide an efficient, personalized air transportation system that responds to the needs of the individual.

A series of breakthroughs in aviation and computing technologies promise a new age of regional business transportation that combines the convenience and productivity of corporate jet travel with the broad availability and affordability of commercial air travel. This new regional transportation option, called "Per-Seat, On-Demand" jet services, will give you the freedom to travel where you want to go, when you want to go based upon *your* schedule, restoring the valuable time you need to become more productive in business, while enjoying a better balance between work and your personal life.

For the past three years, DayJet™ Corporation has conducted extensive market research, interviewing hundreds of business travelers and corporate managers responsible for travel. Drawing from these insights, this white paper discusses the challenges in regional mobility, looks at regional travel alternatives, and examines how "Per-Seat, On-Demand" jet services can benefit you and your organization.

***"Air transportation is an enabling technology. History has shown us that significant advances in transportation have a far greater effect than simply moving people from point A to point B. DayJet represents a new dimension in transportation, making it easier, faster and more cost effective to provide jet service to regions where it is currently unavailable. DayJet services will have significant benefits to individual travelers, local communities and the entire nation."***

Jack Olcott  
President  
General Aero

DayJet Corporation's proposed "Per-Seat, On-Demand" service and any statements made in connection therewith are subject to the receipt of operating authority from the Federal Aviation Administration and the Department of Transportation under Title 49 of United States Code.

## Business @ the Speed of Thought

### The Need for Speed

The world of business is a world of mobility. To effectively compete in today's always-connected economy, companies must be agile. They must be able to move goods, services, people and information where needed, when needed, as needed — quickly and efficiently — to shorten decision cycles, capture fleeting opportunities, and react immediately to changing market conditions.

As Bill Gates wrote, business today takes place at "the speed of thought." The prevalence of the Internet and electronic communication has compressed time and distance, allowing business to be conducted from just about anywhere.

But these huge shifts in technology bring about ripple effects. When technology becomes a norm and multiple companies can provide similar offerings seemingly overnight, personal relationships become a critical differentiator and key enabler of long-term loyalty and retention.

As a result, companies are investing more time in building personal relationships with customers, suppliers, partners, investors, and employees.

### Personal Relationships as Differentiator

While recent advancements in web, video and teleconferencing seamlessly facilitate and increase personal interactions, they do not replace the need for face-to-face communication in business.

In fact, research strongly demonstrates that the more companies interact via virtual communications, the greater the need for face-to-face interactions.

Travel is viewed as a core enabler of day-to-day business operations, which increasingly center on personal relationships. In a recent market survey conducted on behalf of DayJet Corporation, 83 percent of the corporate managers interviewed deemed travel mission-critical or very important in helping their organizations meet corporate objectives.

Business professionals are travelling more to close business deals, drive M&A activity, form strategic alliances, recruit new talent, open plant locations, establish local presence, provide customer service and care, extend management control, speed time-to-market for new products and services, and streamline business processes for greater operational efficiency and profitability. In fact, industry analyst IDC estimates that more than seven million 'road warriors' travel each day.



## Business Challenges

*"The value of personal contact with clients is so important that "Per-Seat, On-Demand" jet services could put air travel back in play again on a short notice instead of considering WebX... It's just not the same thing. You're just not there with the client."*

Vice President of Research  
Marketing Consulting Firm  
Takes 10 regional trips a year

## The State of Regional Travel

### Time is Scarce Commodity

To keep pace with business on the move, professionals are working more hours, handling more job responsibilities with far fewer resources. American workers put in the longest hours in the world. In 2003, the average American adult worked 49 hours each week, up eight hours from 1973, while top executives typically work 50 to 70 hours per week. The American work ethic comes largely at the expense of our personal and leisure time.

Industrial anthropologist Richard Reeves explains:

"Time is the scarce commodity of the new work world. Western economies are diagnosing citizens with 'hurry sickness,' families face a 'time famine.' Meanwhile businesses are coming to terms with the rise of the 24x7 society and concerns over work-life balance. . . . The clear distinction between work and life is breaking down."

Achieving organizational success, career growth and a quality home life is a constant struggle, requiring business people to strike a delicate balance between the demands and aspirations of their personal and professional lives. Research suggests employees don't necessarily want fewer hours, but rather more *control* over their time.

For today's busy professional, saving time is a chief goal. And for many, time has become more valuable than money. Leisure time has become the new status symbol of the 21<sup>st</sup> Century.

### Regional Travel Trends

#### King of the Road

According to the Department of Transportation (National Household Travel Survey, "America on the Go," October 2003), 84 percent of the 405 million U.S. business trips taken during 2004 were regional, and 80 percent of these were by car. Each year, more than 316 million business trips between 50 and 500 miles (one way) are taken by automobile.

The Department of Transportation also reports that in the last three years, the number of people driving 200 to 400 miles (one way) for business increased by more than 25 percent. The Travel Industry Association corroborates this finding, reporting that one-third more organizations are encouraging business travelers to drive for regional trips instead of fly because of the disproportionate amount of airport wait time. ("Auto Travel in the U.S.," 2003).

DayJet's own market research also supports the business driving trend. Almost half of the corporate managers interviewed confirm that driving for regional business trips has grown by an average of 20 percent over the last several years. The reason for the increase? Almost one-third attribute the increase to time; employees can drive to their destination in the same amount of time, or faster, as the amount of time required to fly regionally through a connecting hub. One-fifth attribute the increase in driving to convenience; employees would rather drive in order to avoid airport and security hassles.

An operations manager for a telecommunications company who takes 18 regional trips a year affirms, "Anything under eight hours, I now consider driving." The typical distance most employees are willing to drive is just at two hours (one way), while the maximum distance they are willing to drive is four hours (one way).

***"We have between 50 and 60 people right now in offices all throughout the region. A lot of my customers are hard to get to – you can't get there from here in any kind of quick fashion. Something like "Per-Seat, On-Demand" services is much more effective for us when we're trying to get in and get out to the customers. Right now, our main mode of transportation in the region is to drive."***

Account Manager  
Environmental Engineering Firm  
Takes 9 regional trips a year



## The State of Regional Travel

### Little Choice in Little Towns

For business travelers located in the smaller "tails" of regional markets, there's little choice today but to drive as the number of scheduled flights for both short hops and smaller markets continues to decline.

The U.S. is home to more than 5,000 public-use airports. Although 546 airports across the country are capable of supporting scheduled flights, the hub-and-spoke network dominates. Scheduled air service is highly concentrated: a mere 67 airports account for 90 percent of domestic passenger traffic, while 70 percent of all U.S. passengers are routed through 32 major hub airports.

According to the Department of Transportation (*"Airline Industry Metrics,"* August 2004), there were 37 percent fewer scheduled short-haul flights under 500 miles in 2004 than in 2000. There were also 21 percent fewer scheduled flights at smaller airports in 2004 versus 2000.

Carol Hallet, ex-president of the Airline Transportation Association (ATA), asserts, "As the industry continues to contract, smaller and mid-sized communities will be disconnected from the national air transportation system — a system vital to their economic health."

### Congestion and Delays Rebound

With U.S. commercial air passenger demand expected to reach one billion by 2014, the nation's hub-and-spoke network is approaching capacity. The economic prosperity of the last decade led to record demand for air travel, with nearly 700 million passengers boarding domestic flights in 2000 or a nearly 50 percent increase over the last decade.

During this period, flight delays and airport congestion also reached record levels, with one in four scheduled operations delayed or cancelled. Airline passengers spent 142 million delay-related hours waiting in airports in 2000, costing an estimated \$4.7 billion in added expense and lost productivity. (*"The National Economic Impact of Civil Aviation,"* DRI-WEFA, Inc., July 2002)

With passenger traffic rebounding, 2004 witnessed 1 in 5 flights arriving late — by an average of 58 minutes. A study by NASA and the FAA reveals, "Failure to address the impact of air travel congestion on the mobility of Americans could cost consumers up to \$20 billion a year by 2025." (*"Socio-Economic Demand Forecast,"* January 2004).

Over the past five years, the effective speed of air travel has been steadily declining, with passengers spending more time on the ground than in the air. For distances of less than 500 miles, travel by commercial airlines is no faster than traveling by car.

NASA concludes, "We are a nation that is slowing down, not speeding up, during an age when time is the scarce commodity for all of us."



*"Small communities have been neglected as major airlines concentrate resources on larger markets and larger, more profitable aircraft. The trend of lessening service to smaller markets will continue unless competitively priced, conveniently timed air service can be made available in those communities. Microjets may provide the answer. The exciting aspect of the combination of microjets and on-demand services, if priced competitively, is the vast number of airports and communities that can receive such modern, comfortable aircraft... If it works, it will be a revolution in air travel."*

Mark Sixel  
President and Owner  
Sixel Consulting Group, Inc.

## The State of Regional Travel

### Business Traveler Challenges

Increasingly, business travelers view the inconvenience and overall time associated with regional travel as unacceptable barriers to doing business. The current state of regional transportation has become an inhibitor to the business professional's productivity and quality of life and is threatening to strain a nation dependent on efficient and reliable transportation.

DayJet's extensive market research with business travelers reveals a high level of resentment, anxiety and frustration associated with the current state of regional transportation. Once viewed as a corollary to success on the job, frequent business travel is now viewed as a highly stressful situation. Many associate business travel with:

#### Feeling Out of Control

Today's empowered consumers hold higher expectations than ever and want to be seen as being in control of their lives. But when it comes to travel, road warriors have little control over what matters most — their time. Plagued by travel inefficiencies and system-wide delays, business travelers spend more time on the ground waiting than flying, making them feel helpless and vulnerable. According to a recent Yankelovich Partners *National Business Travel Monitor*, one-quarter of business travelers feel stressed out on business trips, while an equal number find business travel a hassle overall.

A sales technician for an engineering services firm who takes 9 regional trips a year explains, "There's so much wasted time today. So much time waiting for something to happen that's out of your control, so many delays and cancellations. I think travel is so stressful now days. You've heard of mass panic? It's almost like mass stress. Everybody's frustrated and nobody's happy."

### Inefficiency and Wasted Time

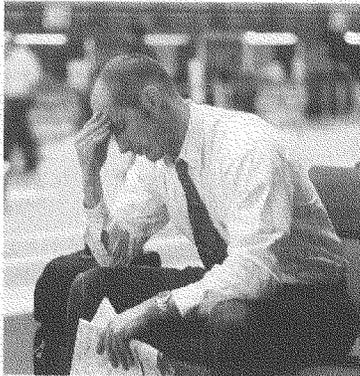
When travelling between smaller regional markets, a typical business trip requires at least a 5-hour flight with connections through a major hub airport (one way), or eight- to ten-hours of drive time (one way). Once meeting time is factored in, most regional business trips typically result in an overnight stay.

According to research from the Travel Industry Association, approximately 80 percent of all business trips involve an overnight stay, with almost one-half requiring one night (flying) or two nights (driving).

As a result, key individual contributors are often taken out of action and forced to focus on a single transaction for the two to three days spent travelling, impacting both employee and organizational productivity. A director of advertising for a publishing company who takes 12 regional trips a year points out, "A day is a day, and I write it off when I travel."

*"There's so much wasted time today, so much time waiting for something to happen that's out of your control, so many delays and cancellations. I think travel is so stressful now days. You've heard of mass panic? It's almost like mass stress. Everybody's frustrated and nobody's happy."*

Sales Technician  
Engineering Services Firm  
Takes 9 regional trips a year



## The State of Regional Travel

### Negative Impact on Personal Life

Family is once again taking center stage, with many business professionals looking to reconnect with what's most important to them. According to a recent Gallup poll, three-fourths of business professionals want to reduce stress, while an equal number want to also simplify their lives.

Contrary to these desires, a recent Yankelovich Partners *National Business Travel Monitor* reveals that almost two-thirds of business travelers have lost confidence in the ability to get from point A to B and back to A without having to go out the night before.

DayJet's own market research corroborates these findings. A chief marketing officer for an outdoor advertising agency who takes 50 regional trips a year stresses, "You cannot go anywhere outside the state without going the night before." Another frequent business traveler laments, "The time spent in airports is time spent out of the office. I have to put in more personal time to make up for it."

A national sales manager for an insurance company who takes 12 regional trips a year states:

"Getting back home at night to me is everything. I want to sleep in my own bed. I want to be back home with my family, so I'll get up at 4:00 in the morning to catch the 6:00 a.m. flight, and take the 11:00 p.m. flight back home in order to be there. I can write off one day rather than writing off two days."

What these business travelers want more than anything is the ability to conduct regional travel in a single day to increase productivity and restore personal time. In fact, DayJet's research with corporate travel managers reveals more than half of regional business trips *could* be conducted in a single day if a viable and affordable travel option were available.

***"It was actually quite substantial when I sat down and looked at what I'm paid, how much it's costing my company for me to sit in an airport, what opportunities I have as far as some sales go when I'm just sitting there. It has cost me thousands, tens of thousands of dollars, and actually some lost sales that I've missed over the years because I was stuck in an airport."***

Vice President of National Sales  
Advertising Agency  
Takes 9 regional trips a year



## Regional Travel Alternatives

### Today's Air Travel Options

Air travel accounts for 20 percent of all regional business trips. Today, business travelers have two options for air transportation: scheduled, commercial service or unscheduled, "on-demand" service.

Scheduled air service generally presents a more cost-effective option, although the fare structure often penalizes last-minute business travellers. The routes and schedules are often inconvenient for business professionals travelling between smaller outlying markets, making it difficult, if not impossible, to complete travel in a single day. Current on-demand alternatives, such as air taxi/air charter, fractional ownership programs, hourly membership cards and corporate-owned and operated aircraft, are more efficient and convenient, but very costly.

The accepted limitations of both — the overall travel time associated with scheduled air service and the largely inaccessible costs of on-demand travel — present significant challenges for many middle managers whose time is a scarce commodity and whose productivity drive the top-line performance of their organizations.

The transformation of the air transportation industry from a premium to commodity service is predicted to cause inevitable consolidation around two systems: a high-volume, low-cost, scheduled service optimized for cost-sensitive travelers and a high value-add, on-demand niche service optimized for time-sensitive travelers.

### A Closer Look at Scheduled Services

The U.S. airline industry can be viewed as both a cause and consequence of our modern economy. Reliable air transportation serves as an economic engine for growth and commerce; each day, more than 200,000 aircraft takeoff and land.

Today, more than 80 percent of Americans have flown — thanks to the airline industry's evolution into a high-volume, low-cost commodity service. Since deregulation in 1978, the airline industry has consolidated operations around a "hub-and-spoke" model, the economics of which are based on demand aggregation and route optimization.

Economics dictate the most efficient way to transport passengers en masse is to bring passengers from multiple points (spokes) to a common point (hub). Passengers are then consolidated onto larger planes filled close to capacity and flown to a new spoke airport. Almost 70 percent of all passengers are centrally routed and aggregated through America's 32 major hub airports. Despite the apparent oddities of flying passengers out of their way to reach a destination, this model has endured for almost 30 years, enabling scheduled carriers to efficiently serve a larger number of destinations with greater frequency than they can with point-to-point operations.

While the hub-and-spoke system is optimal for airline efficiency, it does carry side-effects for the business traveler:

- Nearly every flight involves stopping at a hub airport, adding additional time. More than two-thirds of passengers boarding planes at any given major hub airport are connecting passengers in mid-route rather than beginning or ending a trip.

*"Traveling anywhere with a required change of plane could demand six to eight-hours of travel time. That means a one-day job can take three days to accomplish"*

Harvard Business Review  
June 2002



## Regional Travel Alternatives

- Depending on the location of the major hub airport, the flight may involve considerable backtracking, often flying passengers hundreds of miles (or as much as 40 percent) out of their way to a hub airport just to change planes before flying to their final destination.
- The centralization of air traffic means any event that affects the major hub airport can impact thousands of passengers on scores of flights. The nation's 32 major hub airports account for almost 90 percent of all delays.
- The hub-and-spoke network model does not service large segments of the population. While 93 percent of the nation's population lives within 30 minutes of a small airport without any scheduled service, only 41 percent live within 30 minutes of a spoke airport with scheduled service, and 22 percent live within 30 minutes of a major hub airport.

### A Closer Look at "On-Demand" Services

Recent trends and growth of non-scheduled, on-demand services underscore the frustration of business travelers who would prefer to fly instead of drive to conserve time and maximize productivity. Over the last five years, the number of business travelers flying air charter/air taxi services, participating in fractional ownership and hourly membership card programs, or operating corporate-owned aircraft has been on the rise.

According to a survey by the National Business Travelers Association, three-fourths of NBTA members have formally integrated the use of corporate-owned aircraft and air charter into their corporate travel programs, up from 40 percent in 1996.

The U.S. is home to a highly fragmented air charter/air taxi industry, comprised of approximately 2,500 companies, the vast majority of which own and operate only one or two aircraft. Two-thirds of air charter/air taxi operators earn less than \$1 million in revenue each year, while 90 percent earn less than \$5 million in revenue.

Air charter operators typically offer round-trip pricing that includes positioning fees and empty leg charges, even if the passenger is only flying one-way. Recent formation of hourly membership card programs that sell bulk charter hours in 25, 50 or 100-hour segments promote one-way passage. However, the membership rates, starting at \$100,000 for 25-hours, indirectly factor in back-haul and repositioning charges.

*Today, less than five percent of U.S. business travelers reap the benefits of on-demand air transportation.*



## Regional Travel Alternatives

While filling an important role for those whose time is critically important, the rate of market growth for on-demand alternatives has been limited for several reasons.

The first of which is the high capital costs of acquiring the aircraft itself. A medium-size jet, such as a Learjet 60 seating six passengers, costs approximately \$12 million to acquire. Right off, the capital costs establish the need to charge higher rates (a minimum of \$2,000 or more per operating hour). As a result, this automatically restricts market demand to those few who can afford such rates.

With people paying \$2,000 an hour, customer expectations are naturally quite high. Each trip becomes a custom, "hand-crafted" experience catering to every luxury and whim of each passenger.

Further, high customer expectations also result in uncontrollable back-haul costs for the operator because the customer dictates where the aircraft will fly — even if the operator has no other customers in the area to which he is flying. This results in the need to either: ferry the crew back home via scheduled or other charter service; let the aircraft and crew sit for a couple of days in the area waiting for the passenger to return home; or fly the aircraft back empty.

Directly or indirectly, the consumer will have to absorb the back-haul costs and downtime of the aircraft, which feeds back into the restrictive pricing and market model of current on-demand services.

As a result, on-demand travel options are out of reach for all but the most senior executives, in larger organizations. Today, less than five percent of U.S. business travelers reap the benefits of on-demand air transportation.

Many middle managers in travel dependent positions, such as the regional manager or sales representative, have roles in which travel is mission-critical, but they cannot justify the cost of on-demand travel in relation to the benefits. Instead, they end up wasting considerable time in trying to fulfill their travel commitments — typically by driving.

***"What's exciting is being able to offer on-demand jet service in the 'long tails' of the market between less-traveled city pairs where jet travel is currently unavailable or too expensive for 'normal people.'** DayJet brings one-to-one service to air travel just as the Internet has brought one-to-one applications to so many other markets."*

Esther Dyson  
Editor  
Release 1.0



## Technological Innovation Reshapes Air Travel

### A Confluence of Events

It seems most developments that spur fundamental industry change are the result of serendipity. Such moments — when two or three transformative innovations happen at the same time — create a "whole" that is far greater than the "sum of its parts." When events like this happen, new industries are born, and new market opportunities emerge, as we have seen recently in the computer, telecommunications and automotive industries.

Aviation is an industry that has been largely bypassed by the technology revolution of the last several decades. Planes have become larger and faster in the 50 years since the introduction of the first commercial jetliner, but the fundamental technology of the commercial jet has changed little over this time; and logistics systems, such as flight traffic control, use the same manual procedures as they did in the 1960s. . . *until now.*

The aviation industry is on the cusp of delivering a breakthrough in air transportation. This breakthrough has been made possible by a number of discreet technology developments that have serendipitously occurred together.

Advances in powerplants, integrated avionics, and aircraft manufacturing techniques are poised to deliver a new generation of very light jet (VLJ) aircraft offering significant improvements in price/performance, safety and operational efficiencies.

Advances in information technology and the prevalence of affordable computing power now allow large-scale logistics problems to be solved in real-time, serving to make what was once an elite mode of transportation (on-demand services) broadly available and affordable on a "per-seat" basis.

### A New Class of Aircraft

The emerging class of VLJ aircraft are a smaller, quick and more efficient category of jet aircraft. National Business Aviation Association (NBAA) defines the VLJ category as jet aircraft weighing 10,000 pounds or less — a distinction from the traditional definition of light aircraft weighing 12,500 pounds or less, and large aircraft weighing more than 12,500 pounds. VLJ aircraft will ultimately be certified for single pilot operations. Additionally, many VLJ aircraft will feature: advanced cockpit automation, such as moving map display and multi-function displays; automated engine and systems management; and integrated auto-flight, auto-pilot, and flight-guidance systems.

Since inception of the VLJ concept in 1998, approximately 12 companies have announced plans to build or evaluate developing a VLJ. The first VLJ aircraft are expected to be available in 2006.

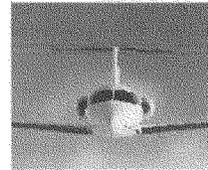
In comparison to current small aircraft, a traditional Cessna CJ1 five-passenger jet has a base price of \$4 million, and the King Air C90, a popular turbo-prop aircraft, has a base price of approximately \$2.6 million. The operations profile of VLJ aircraft vary by manufacturer, but generally VLJ aircraft:

- Carry 3 to 5 passengers
- Have a range over 1,000 miles
- Travel at speeds between 350 and 390 nautical miles per hour
- Fly at altitudes of 19,000 to 30,000 feet

Comparable turbo-prop planes typically travel at speeds between 150 to 200 miles per hour at altitudes of 12,000 to 19,000 feet.

*"A paradigm shift is coming in personal transportation that will replicate the personal computing phenomenon. Every aspect of society over the past five decades has been going toward individual choice — cars, PCs, your cell phone. But with the one big component of our economy, air transport, everybody has decided its OK to go Greyhound."*

Vern Raburn  
President & CEO  
Eclipse Aviation Corporation



## Technological Innovation Reshapes Air Travel

### **VLJ Aircraft Necessary but Not Sufficient New Market Enabler**

While the emerging category of VLJ aircraft is necessary to achieve a new threshold in cost-efficient operations, the VLJ price points in conjunction with the "traditional" air charter/air taxi model alone are not sufficient enough to drive down the costs of on-demand jet travel to enable significant market expansion. The bottom line: you cannot just apply new-generation VLJ aircraft to the "traditional" air charter/air taxi model and expect far different results.

The proposed VLJ price tag of \$1.5 to \$2.8 million per aircraft can help mitigate the overall cost of capital equipment (versus \$4 million or more per current small jet aircraft), making it feasible for operators to offer an incrementally cheaper version of traditional air charter.

For example, whereas a CJ1 air charter operator may charge \$1,500 an hour, a VLJ air charter operator could conceivably charge \$1,100 an hour.

While this price point may create incremental interest and no doubt attract some first-time users of on-demand services, the pricing difference is just not material enough to spark broad market acceptance and demand. Such prices are more than what a salesperson (and his manager) is willing to pay to visit a customer at month's end.

What's missing is a fundamentally new value proposition that can ignite a whole new market segment — one that can drive down the price of on-demand services to create a critical mass of demand to minimize unprofitable back-hauls. Of course, in the world of aviation, the only way to increase revenue is to increase fleet size, so this new value proposition would necessitate a large-scale operation.

Bruce J. Holmes, senior researcher for the Small Aircraft Transportation System (SATS) postulates:

"A new generation of small turboprop, high-performance but low cost aircraft are at the heart of this transformative market. But what happens next is equally important. Those aircraft open a whole new field of innovation for entrepreneurs to buy aircraft by the crate and put them into fleet operation. Therein lies another key element of this whole innovation, which is how to take hundreds of aircraft and put them into an on-demand fleet operation so the fleet, in a network-like way, can learn where customers want to go dynamically. Use of modern tools and advancements in the science of networks is one of the key ingredients in how this innovation moves forward."

***"A new 'Per-Seat, On-Demand' model would enable business travelers to more easily reach manufacturing plants, suppliers or partners in obscure locations that are difficult to reach using traditional airlines. Introducing an innovation such as this – one that would build to demand – must come from a CEO who has used emergent strategy processes to create a new-market disruption in another service business. It will require an outside perspective to enact this type of disruptive innovation in the aviation industry."***

Clayton Christensen  
Professor, Harvard Business School  
"Seeing What's Next," 2004



## Technological Innovation Reshapes Air Travel

### Scaling On-Demand Operations is Hard

Unlike scheduled airline operations — which create a fixed schedule, optimize it for profitability, publish it twice a quarter, and match passengers to the aircraft (and schedule) — on-demand operations are purely random events. This is because the on-demand operator does not determine the schedule. In fact, there is *no* schedule: departure and arrival locations and times are set by the customer. The operator fundamentally brings the aircraft to the passenger. On-demand operations are a constantly changing, dynamic space with no day quite like any other.

The dynamics of an on-demand environment make scaling operations very complex. As a result, according to the Department of Transportation, there are only five on-demand operators with more than 100 aircraft, primarily the large fractional programs. But even these large operators find it difficult to dispatch more than 120 aircraft in a single class.

Today, matching demand with supply is largely a manual process in the on-demand world. A large room of people hand-match passengers to aircraft, bidding each and every trip leg, in what closely resembles the Chicago Board of Options. In this type of environment, the goal at hand is to just match up customer requirements with a feasible solution, much less an optimal one. For every new aircraft added to dispatch, on-demand operators have to add more people to handle the aircraft. With the increase in people, comes an increase in complexity; and soon, diminishing returns set in because of communications overhead.

Scaling on-demand operations is, indeed, a complicated issue.

### A New Category of Service

An equally important technology advancement necessary to stimulate new market creation is the development of a real-time operations system that can match demand with supply in real-time... *at large scale.*

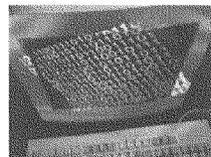
The growing availability of inexpensive computing power and advances in applied science and mathematics now enable the development of breakthrough solutions to massively complex logistics and scheduling problems in real-time. For the past three years, DayJet has been engaged in pioneering research in a new field of logistics to real-time optimization. During this same period, the company has been implementing these logistics breakthroughs in an operational infrastructure necessary to run a large-scale on-demand jet service on a "per-seat" basis without publishing schedules — something often promised but never realized in commercial aviation.

DayJet's real-time operations system encompasses the necessary dispatching, integrated planning and optimization tools to make real-time automated decisions on a large-scale basis. This core infrastructure will allow DayJet to efficiently serve sparse demand in outlying "tails" of the market, while driving its cost of services down to make on-demand jet travel broadly available and affordable on a "per-seat" basis, thus introducing a new way to operate: "Per-Seat, On-Demand."

**"Per-Seat, On-Demand"**  
*air travel is revolutionary because it simply could not be done before.*

**The technology did not exist. And no, we aren't talking about aircraft technology, but scheduling technology."**

Robert X. Cringley  
"Jet Me to Work," PBS  
May 5, 2005



DayJet Corporation's proposed "Per-Seat, On-Demand" service and any statements made in connection therewith are subject to the receipt of operating authority from the Federal Aviation Administration and the Department of Transportation under Title 49 of United States Code.

## Technological Innovation Reshapes Air Travel

The noted author, PBS commentator and airplane pilot Robert X. Cringley has taken a close look at DayJet's "Per-Seat, On-Demand" strategy and offers the following commentary:

"Per-Seat, On-Demand" air travel is revolutionary because it simply could not be done before. The technology did not exist. And no, we aren't talking about aircraft technology, but scheduling technology... This may not seem like much of a routing task, but it is a vast increase in complexity over anything else the aviation industry has tried before."

### Why Now?

Although on-demand operators have attempted to offer "Per-Seat, On-Demand" services in the past, they inevitably wind-up offering "per-seat" services on a scheduled basis — either implicitly or explicitly — by posting empty seats or trips legs on the Internet; or the service inadvertently becomes scheduled "by reputation." This means that through word-of-mouth and general observation, you learn that an air taxi operator flies from point A to point B regularly every week at the same time, and you can call and book a seat on that flight.

These practices are contrary to the nature of the FAA's view of on-demand operations, which contemplate that each flight or trip must be individually negotiated with the customer; it's the customer who sets the departure and arrival locations and times.

Historically, "Per-Seat, On-Demand" operations have been tied to a schedule. True "Per-Seat, On-Demand" air services have never been done before.

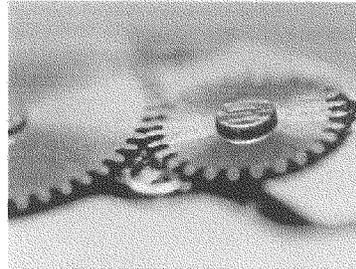
The difference between traditional air taxi/air charter and "Per-Seat, On-Demand" jet services, such as that offered by DayJet, is that "Per-Seat, On-Demand" is a commercially scalable service that will be sold by the seat and operate exclusively on-demand. Every seat will be individually negotiated — it won't matter if you are the first on-board or the last — "Per-Seat, On-Demand" will fly according to your individual needs.

It's only now that technology advances in aviation have converged to deliver high-performance VLSJ aircraft with affordable acquisition and operating costs, so operators can acquire significantly more aircraft for the same capital investment. For instance, instead of purchasing ten \$10 million aircraft, fleet operators can now purchase 100 \$1 million aircraft for the same capital outlay. This gives operators much more scheduling options and flexibility — but increases the level of complexity exponentially in terms of scheduling logistics.

While the hardware itself is truly breakthrough, it's only through advances in information technology and the advent of advanced real-time scheduling and logistics that make it possible to sustain high-volume operations at low cost. The missing ingredient has been the integration of real-time operations systems to enable "Per-Seat, On-Demand" services.

*"The driver behind this [DayJet] 21st Century revolution is, as might be expected, the awesome power of information technology, but in this case harnessed in totally innovative ways to transform the way we buy, use and experience air travel."*

Nigel Powell  
"Reach for the Skies"  
The Red Ferret Journal  
May 10, 2005



DayJet Corporation's proposed "Per-Seat, On-Demand" service and any statements made in connection therewith are subject to the receipt of operating authority from the Federal Aviation Administration and the Department of Transportation under 14 CFR of United States Code.

## A New Category of Travel

### What is "Per-Seat, On-Demand" Jet Services?

"Per-Seat, On-Demand" jet services is a new class of transportation for short-haul (under 600 miles) regional travel that combines the convenience and efficiency of corporate jets with the affordability and availability of scheduled airlines. "Per-Seat" means you pay only for the seat you reserve, not the whole aircraft. "On-Demand," means you fly where and when it is convenient for you.

This new class of service is enabled only recently through the confluence of new-generation aircraft 'hardware' and real-time operations 'software' — coupled with a new vision of how regional business travel should work. This unique combination will result in a cost-effective, highly efficient and reliable transportation alternative that meets the rigorous demands for priority business travel.

### Defining Characteristics

The defining characteristics of "Per-Seat, On-Demand" are as follows:

- **Per-Seat** – A "shared ride" service sold by the individual seat, with advance reservations. You pay only for the seat(s) you require, rather than the whole plane.
- **On-Demand** – Operates under existing Part 135 on-demand regulations, with individually negotiated, non-scheduled service. You fly on-demand, according to your schedule, for ultimate convenience. "Per-Seat, On-Demand" services do not publish a schedule, nor do they operate on a schedule other than *yours*.
- **Direct** – Flies point-to-point to and from small community airports and does not fly into major hub airports or require you to switch planes.

For ultimate reliability and control, you fly from a community airport close to where you live or work, to a community airport close to your final destination.

- **Affordable** – Priced slightly higher than full-fare coach means you get all the benefits of a corporate jet experience for a fraction of the price. You pay about the same cost of an overnight travel (including airfare, hotel, and per diem).

"Per-Seat, On-Demand" jet services establish a new value proposition from traditional air taxi/air charter services as follows:

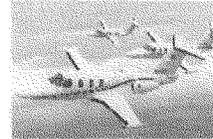
Traditional air taxi operations require customers to rent the whole aircraft for a round trip, even if the customer is flying one-way, and will fly virtually anywhere the customer dictates. The value proposition centers on luxury travel — the customer is made to feel like the owner while aboard the aircraft, and every whim is catered to. All of this comes at a steep cost, averaging \$4 to \$10 per mile at minimum.

"Per-Seat, On-Demand," on the other hand, is focused on a "no-frills" utilitarian value proposition designed to bring reliable, mission-critical on-demand travel to more people and organizations. In order to make this form of on-demand travel broadly affordable, "Per-Seat, On-Demand" services are sold by the seat, operate only within a pre-defined, bounded region and are priced at a premium to full-fare coach airfares — ranging between \$1 to \$3 per mile.

The key enabler to "Per-Seat, On-Demand" services is 100 percent automation of scheduling and planning to achieve scalable operations at low cost.

*"Forecast International has been briefed on the DayJet blueprint, and we believe this level of customized service should receive a receptive market. DayJet's Per-Seat, On-Demand service offers convenience and affordability, providing a whole new range of travel options."*

Bill Dane  
Analyst  
Forecast International



## A New Category of Travel

### A New Market Opportunity

The introduction of local area networking in the mid-1980s filled a latent need, file sharing, which could not easily be performed before. Prior to local area networks (LANs), there was "sneaker-net," where disks were passed around internally and externally to share and exchange information. Through the birth and growth of LANs, the personal computer market expanded significantly. The power of file sharing drove demand for the overall PC market — local area networking served as an incremental market.

Similarly, "Per-Seat, On-Demand" jet services will simply become an additive market to the current air transportation landscape. Why is this? DayJet's mission is to create a peer-to-peer on-demand transportation network between secondary and tertiary markets.

The primary beneficiary of "Per-Seat, On-Demand" services will be business professionals in these markets who have little choice but to drive today because they have no direct air service in their markets; air travel through hubs cannot be readily accomplished in a single day. When faced with a choice of flying 5 to 6 hours (one way) with a connection in the middle versus driving 8 to 10 hours (one way) between secondary markets, most business travelers currently opt to drive, since they have to spend the night anyway.

When "Per-Seat, On-Demand" jet services are introduced into small regional markets with no direct air service, DayJet's modelling and research confirms that business for the scheduled airlines *increases*. The primary users of "Per-Seat, On-Demand" services simply weren't flying before...they drove.

Introducing "Per-Seat, On-Demand" services into these markets helps to round out the ability to accomplish same-day travel in a cost-efficient and productive manner. The "Per-Seat, On-Demand" peer-to-peer network, once superimposed on top of the scheduled airline's hierarchical network, serves to create more choice, stimulate multi-mode travel, and offers little intrusion.

"Per-Seat, On-Demand" services help business travelers bridge the gap in the airline's asymmetrical fixed schedule, providing a "variable" back-end that can be customized to the individual's needs so trips can be accomplished in a single day.

What DayJet's research demonstrates is that when scheduled airline services are available and meet business traveler's needs, the preference is to travel scheduled airlines because they are cheaper. However, the airline's asymmetrical fixed schedules often don't accommodate business traveler's ability to get back home, resulting in an overnight stay.

What business travelers will tend to do when given a choice is to fly scheduled airlines for one part of the trip to maximize dollar savings, while flying "Per-Seat, On-Demand" jet services for the other part of the trip to maximize time savings. This allows them keep travel to a single day, while balancing ancillary costs with the increases in personal productivity and quality of life that fit well within their organization's travel guidelines.

***"Per-Seat, On-Demand" jet services will simply become an additive market to the current air transportation landscape. DayJet's mission is to create a peer-to-peer on-demand transportation network between secondary and tertiary markets.***



DayJet Corporation's proposed "Per-Seat, On-Demand" service and any statements made in connection therewith are subject to the receipt of operating authority from the Federal Aviation Administration and the Department of Transportation under Title 49 of United States Code.

## A New Category of Travel

### A Recognized Need

This new category of transportation will redefine the total cost of travel — both in time and money. Similar to the way the personal computer and Internet empowered individuals to access and process data on a "personalized" basis, "Per-Seat, On-Demand" jet services promise to make the air travel experience more convenient, on-demand and available, according to the individual's needs.

A December 2004 Department of Transportation report entitled *"Next Generation Air Transportation System Integrated Plan"* recognizes the critical role V/LJ aircraft and on-demand services will play in the future:

*"The entire concept of the airline schedule will be redefined as the boundaries between traditional carriers and on-demand service providers begin to merge. This proliferation of options will effectively enable customers to choose air transportation services tailored to their needs."*

### Market Reaction

Over the past two years, DayJet has talked with hundreds of business travelers and corporate managers across more than 30 industries and 70 job functions to gain a first-hand understanding of their regional business travel frustrations and priorities. They overwhelmingly agree that "Per-Seat, On-Demand" travel can help restore the balance between productivity and quality of life when travelling.

On average, 75 percent of business travelers participating in DayJet research indicated they are willing to try "Per-Seat, On-Demand" services at least once when it is available in their city for the sheer convenience and productivity benefits. An equal number of corporate managers are also willing to allow their travelers to try "Per-Seat, On-Demand" services.

A recent *USA Today* online poll also reveals strong interest in "Per-Seat, On-Demand" jet travel. More than 3,000 people responded to an online survey, which posed the question: "How likely are you to patronize an on-demand airline flying very light jet (VLJ) aircraft?" More than half of survey respondents said they will try "Per-Seat, On-Demand" jet services.

According to the poll, a total of 51 percent of survey participants answered "yes" to the question, indicating that they would patronize an on-demand service such as that offered by DayJet. Survey participants could only provide one answer. Ten percent acknowledged "I've been waiting for this chance my whole life," while 28 percent answered "seems convenient; I'm anxious to give it a go," and 13 percent agreed "I'll try anything once."

*"The entire concept of the airline schedule will be redefined as the boundaries between traditional carriers and on-demand service providers begin to merge. This proliferation of options will effectively enable customers to choose air transportation services tailored to their needs."*

*"Next Generation Air Transportation System Integrated Plan"*  
Department of Transportation  
December 2004



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**A New Category of Travel**

Twenty-two percent of *USA Today* respondents expressed some concern about the anticipated price of on-demand jet travel. This concern is consistent with DayJet's own research findings.

Clearly, business travelers will not use "Per-Seat, On-Demand" travel for all their travel needs. Where people can plan ahead and secure cheaper airline fares that accommodate their schedules, they will.

"Per-Seat, On-Demand" jet services is viewed as an enabler and productivity booster, helping business professionals accomplish things they couldn't do as efficiently or as easily before. More significantly, "Per-Seat, On-Demand" jet services arms business professionals with more choice, allowing them to match the best mode of travel to the task at hand.

Accordingly, almost two-thirds of business travelers and corporate managers said they would replace half of their car trips over 300 miles with "Per-Seat, On-Demand" services.

Following are representative business traveller comments about "Per-Seat, On-Demand" jet services:

*"It's a complete paradigm shift in transportation as we know see it. It's a complete paradigm shift."*

Attorney  
Takes 12 regional trips a year

*"This would give you the opportunity to take advantage of things you might otherwise hesitate to take advantage of... it's the ability to take advantage of an opportunity at an affordable cost, not just in terms of airfare, but in terms of the amount of time consumed."*

Vice President of Strategic Planning  
Marketing Consulting Firm  
Takes 10 regional trips a year

*"I think what happens is once you have this availability, it creates more of these kinds of opportunities. Right now, most of us would say, 'Man, I can't do it. You just can't get it done.' But now [with DayJet], you've got the ability to do it. You'd be more likely to say, 'I think I'm going to jump on that plane and go see that guy.' This, in fact, is more of an enabler."*

Vice President  
Banking Industry  
Takes 9 regional trips a year



**A recent USA Today online poll reveals strong interest in "Per-Seat, On-Demand" jet travel.**

**More than 3,000 people responded to an online survey, which posed the question: "How likely are you to patronize an on-demand airline flying very light jet (VLJ) aircraft?"**

**More than half of survey respondents said they will try "Per-Seat, On-Demand" jet services.**

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## Business Advantages of "Per-Seat, On-Demand"

### Operating at the Speed of 21<sup>st</sup> Century Business

"Per-Seat, On-Demand" jet services will fill the gaps in regional transportation to restore the ability to conduct day trips to and from small regional markets. This breakthrough will not only bring all the productivity benefits and competitive advantages of corporate jet travel to more people and more organizations, but it will also change the landscape of regional business travel, allowing business travelers in small, outlying markets to move at the speed of 21<sup>st</sup> Century business.

With "Per-Seat, On-Demand" jet services, the future of business travel includes:

- The *flexibility* of booking a flight where you want to go, when you want to go, based solely on your needs.
- The *convenience* of flying direct from the community airport close to where you live or work to the airport close to your final destination without the added stress and time of traveling through major hub airports.
- The *productivity* gains of conducting multiple business meetings in different cities — in a single day — and returning home that same evening to be with your family or friends.
- The *value* of controlling precisely how you spend your travel time to better balance the demands of your professional and personal life.

The resulting productivity gains go straight to companies' bottom lines, while improving the quality of life for the wide spectrum of workers whose jobs require frequent travel.

For the first time, "Per-Seat, On-Demand" jet services will make on-demand business travel economically viable for mid-level managers, sales and customer service organizations, and mobile professionals of medium and small organizations.

### Key Benefits

Here's how "Per-Seat, On-Demand" travel will benefit you and your organization:

#### Turn Wasted Travel Time Into Valuable Business & Personal Time

DayJet can turn a two-day travel schedule for a two-hour business meeting into multiple meetings, with multiple customers, in multiple markets, all in the same day. DayJet service will allow for twice the travel in half the time through the increased ability to do day trips, plus the ability to do multiple meetings in a single day. With DayJet service, you'll spend more time doing business and less time traveling. Your productivity will soar, and you'll get back in time to enjoy a well-deserved home life, too.

#### Reach New Opportunities in Out-of-the-way Markets Easily

Some of your biggest business possibilities may be in hard-to-reach destinations or in new markets far from commercial scheduled air service. DayJet makes it easy to get there... *fast*.

With DayJet, there's none of the wasted time and hassles of driving endless hours to and from meetings or going through congested, out-of-the-way hubs on commercial airlines. DayJet will enable you to fly from a nearby community airport and land at an airport close to your final destination, all on your schedule. So you can spend your time accomplishing what needs to get done.

*"DayJet can turn wasted travel time into valuable business and free time. To me, the value of time is defined as: can I drop my son off at school in the morning, get to the airport, make my trip, and be back in the evening to see his basketball game? DayJet will allow me to use my time more efficiently, so I can meet all my travel demands yet still be at home in the evening."*

William Downey  
Director of Advertising  
Publishing Industry  
Takes 12 regional trips a year



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## Business Advantages of "Per-Seat, On-Demand"

### Same Day Travel for Overnight Prices

DayJet makes the cost of on-demand business travel make sense for more businesses and more employees.

Now the benefits of efficient, on-demand travel can extend to all businesses at prices competitive to the total cost of commercial travel. Our same day travel philosophy lets you spend more of your business day doing business for about the same cost as overnight travel (including airline fare, hotel, and per diem). "Per-Seat" pricing provides your business with the efficiency of corporate jet travel, but at a fraction of the cost — you pay only for the seat(s) you reserve.

### On-Demand Means on Your Schedule

DayJet lets you take advantage of unforeseen opportunities and gain a competitive advantage. DayJet will fly on your schedule, taking you where you need to go, when you need to go. So you're ready to move when high-impact or priority business opportunities arise.

DayJet service will be flown on-demand, direct to your destination. You select the airports of departure and destination, in addition to the time you need to arrive. *You decide.* We'll be ready and waiting for you . . . instead of the other way around.

### Get Business Done Without Losing Sleep

DayJet's on-demand service will allow you to use your time more efficiently, so you can meet all your travel demands and still sleep in your own bed at night. With DayJet, you can control your travel schedule and have far greater control over your personal life and commitments outside of the office.

Finally, work/life balance is achievable. DayJet will provide convenient, hassle-free, same-day travel that brings you home faster and in a better state of mind. Direct, on-demand travel means more personal and leisure time, and a happier, healthier you.

### Who Stands to Benefit Most?

"Per-Seat, On-Demand" jet service is a productivity tool geared toward the people *doing* the work, not just those leading the organization. Designed as a "no-frills" utilitarian service to drive productivity gains for mid-level managers in mission-critical positions, "Per-Seat, On-Demand" jet services are ideal for:

- Regional sales forces that need to visit customers at quarter's end
- Field technicians who must quickly service their customer's equipment
- Attorneys that must regularly give depositions at county or state courthouses
- Real estate developers that must survey property in a rural location
- Business development managers that visit ten franchise stores every month
- Small consulting firms that need to respond to last-minute client requests

A marketing supervisor for a restaurant franchise who takes 12 regional trips a year acknowledges:

"DayJet is ideal for multi-hop travel. Instead of spending 3 to 4 days to visit 10 restaurants in an area, which I do today, I could spend 1 or 2 days to accomplish the same task so I can get home that much sooner."

*"My job demands flexibility when traveling between our regional labs. As such, rather than flying today, I tend to spend seven hours (one way) in my car driving between lab locations. Usually, I drive after hours in order to maximize my work day. DayJet will operate on my schedule, making me more efficient and productive on the job while helping me to recover lost time that can put me back home. I will be able to accomplish what needs to get done at work but also have more free time for my family and personal interests."*

Rick Camp  
President, Enco Analytix  
Takes 30 regional trips a year



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## Enabling "Per-Seat, On-Demand" Jet Services

### A New Innovation in Business Travel

To achieve its vision of "Per-Seat, On-Demand" jet services, DayJet™ Corporation has teamed with Eclipse Aviation Corporation, manufacturer of new-generation small jet aircraft located in Albuquerque, New Mexico.

The Eclipse 500 jet offers significant improvements in operational efficiencies by leveraging innovative manufacturing techniques, highly efficient engines, and an unprecedented level of aircraft integration to introduce unparalleled price/performance and safety for small jet aircraft.

Eclipse Aviation selected Pratt & Whitney Canada to supply the engines for the Eclipse 500 and Avidyne Corporation to supply the avionics. Together, these three organizations have shown great innovation and commitment in developing the platform upon which DayJet will deliver its jet services.

### Aircraft by Eclipse Aviation



ECLIPSE  
AVIATION

The Eclipse 500 twin turbofan jet aircraft operated by DayJet Corporation will accommodate two professional pilots and three passengers. The Eclipse 500 cruises at a brisk 375 knots, turning short-haul (600 nautical miles) regional business trips into quick 1 to 2 hour hops. The Eclipse 500 is also engineered for safety. A 41,000-foot ceiling avoids most severe weather, while advanced integrated avionics decrease pilot workload.

Thoughtful, ergonomic interior appointments by BMW Group DesignworksUSA provide an exceptionally comfortable travel experience. One look and you know... regional business travel will never be the same. For more information on Eclipse Aviation, visit [www.eclipseaviation.com](http://www.eclipseaviation.com)

*"The 'Per-Seat, On-Demand' opportunity is significant, and DayJet's strategy to leverage technology to create a scalable, on-demand transportation service positions the company to be a leader in this dynamic market.*

*Ed's deep background in both technology and aviation gives him a compelling advantage — the vision to imagine a new future for regional air transportation, and the real-life operations, logistics and service expertise required to make it happen. We are very excited to supply the fleet of next-generation aircraft that will enable DayJet to transform the regional business air travel experience."*

Vern Raburn  
President & CEO  
Eclipse Aviation Corporation

***"Eclipse could dramatically change the way in which we travel in the country, particularly the business traveler."***

Robert S. Walker  
Representative (R) Pennsylvania  
Former Chairman  
Commission on the Future  
of the U.S. Aerospace Industry



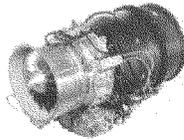
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**Enabling "Per-Seat, On-Demand" Jet Services**

**Powerplant by Pratt & Whitney**



The Eclipse 500 aircraft is powered by two Pratt & Whitney Canada PC610F engines. Based in Longueuil, Quebec, Pratt & Whitney Canada (P&WC) is a world leader in aviation engines powering business, general aviation, and regional aircraft and helicopters. The company also offers advanced engines for industrial applications. P&WC's operations and service network span the globe. P&WC is a subsidiary of United Technologies Corporation (NYSE:UTX), a high-technology company based in Hartford, Connecticut. For more information on Pratt-Whitney Canada, visit <http://www.pwc.ca>



*"We have been working with the management team at DayJet who have the right approach, systems and experience in successfully managing and growing complex organizations. We believe this powerful combination will benefit regional business travelers. We are proud to be working with them to write a new chapter in aviation history."*

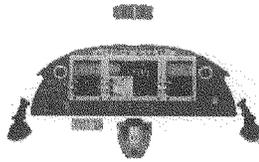
Alain Bellemare  
President  
Pratt Whitney Canada

**Avionics by Avidyne**



Avidyne Corporation is supplying avionics and integrated electronics for the Eclipse 500. Based in Lincoln, Massachusetts, Avidyne is revolutionizing the future of flight for business and commercial aviation through the power of today's most advanced technology. The company is leading the avionics industry with innovative products that greatly enhance pilots' situational awareness and safety during every phase of flight.

For more information on Avidyne Corporation, visit [www.avidyne.com](http://www.avidyne.com)



*"Avidyne was the first company to apply the advances of the personal computer and networking era to create integrated flight decks. Through our work with Eclipse and other advanced aircraft manufacturers, Avidyne is playing a key role in the 'Per-Seat, On-Demand' air service market."*

*With its unmatched operations expertise, DayJet has developed the real-time operations system that enables flexible jet service based on these new aircraft. DayJet, Eclipse and Avidyne, working together, will provide business travelers with a new level of flexibility and productivity."*

Dan Schwinn  
President  
Avidyne Corporation

*"Micro-jets are poised to open an entirely new market in the aviation industry by offering travelers convenient, economical and rapid on-demand transportation. At Pratt & Whitney Canada, we are excited to serve this emerging market with our new PW600 family of engines, designed to provide the best possible combination of flexibility, speed, safety and economical operation for the next generation of very light jets."*

Alain Bellemare  
President  
Pratt Whitney Canada

DayJet Corporation's proposed "Per-Seat, On-Demand" service and any statements made in connection therewith are subject to the receipt of operating authority from the Federal Aviation Administration and the Department of Transportation under Title 49 of United States Code.

## Future of "Per-Seat, On-Demand" Jet Services

### Think Global, Act Local

Beyond the corporate and individual business traveler benefits, "Per-Seat, On-Demand" services may have broader, positive community effects on how and where we live and work.

As the U.S. population continues to migrate into rural areas beyond the suburbs, "Per-Seat, On-Demand" jet services will ensure reliable, quality air transportation for communities hundreds of miles away from major cities. By 2025, NASA anticipates half of the U.S. population will settle into small, rural communities.

This third-wave migration pattern mirrors trends in ubiquitous Internet access and the dispersion of America's workforce into homes and remote branch offices away from centralized headquarters.

In the near future, the freedom of information access and the freedom of air travel through "Per-Seat, On-Demand" jet services will combine to dramatically open up the global economy for many more communities and enhance quality of life.

### The Role of SATS

Recognizing the critical role of air transportation on the nation's economy, NASA has worked diligently over the past decade to rejuvenate the general aviation industry as a practical transportation option in the 21<sup>st</sup> Century.

NASA's vision of a Small Aircraft Transportation System (SATS) is that of an equitable, distributed, on-demand, point-to-point, near all-weather transportation system using small aircraft to fly into and out of the thousands of under-utilized small, regional and rural airports — many without radar or ground control support.

This system would complement a scheduled commercial air transportation system, providing reliable, convenient and safe air travel without further burdening our National Air Space.

SATS research has focused on four operating capabilities that would allow:

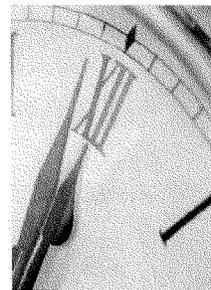
- Higher volume operations at airports that don't have control towers or terminal radar
- Pilots to land safely in low visibility conditions at minimally equipped airports
- Increased single-pilot performance to enhance safety and mission reliability
- Further integration of SATS aircraft in the nation's airspace system

DayJet is not reliant on implementation of SATS technologies to begin operations. However, the company believes many concepts pioneered by SATS are complementary and serve as an essential next step for pervasive "Per-Seat, On-Demand" jet services.

In particular, aircraft-based separation and sequencing systems, reduced landing minimums, and local area ATC can help DayJet increase the volume of operations at its busiest airports and expand the number of small airports it can utilize across the country. Single pilot operations will also benefit "Per-Seat, On-Demand" operators once services are well established.

***"Industry is poised to launch new services in the marketplace that will fundamentally change the way we travel in America. Over the next several years, we will see individuals making more widespread use of local community airports with point-to-point public transportation using a new-generation of small jets to meet their demands for better management of their time and better management of their mobility."***

Bruce J. Holmes  
Senior Researcher  
Small Aircraft Transportation System



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## About DayJet Corporation

### About Us

DayJet was founded in 2002 to fill a market void for commercial-scale, on-demand air transportation. The company will build and operate the nation's first "Per-Seat, On-Demand" regional air service based on a new generation of very light jet (VLJ) aircraft and its own real-time operations system.

DayJet has a simple yet powerful mission: to make on-demand regional travel widely accessible and affordable. The company aims to make what is currently an elite mode of transportation (on-demand jet travel) broadly available and affordable on a "per-seat" basis, uniquely tailored to each passenger's individual schedule, and priced slightly higher than full-fare coach airfare.

The company is designed from the ground up to deliver the highest availability, reliability and flexibility in on-demand jet travel through technology-enabled transportation services. The combination will make it possible to offer an affordable alternative for you to fly direct — where you want, when you want — increasing your productivity and enhancing your quality of life.

To achieve our vision, DayJet has teamed with Eclipse Aviation Corporation, a leading manufacturer of new-generation, small jet aircraft. DayJet will own, manage and operate its own fleet of aircraft as an on-demand air carrier under existing FAA Part 135 on-demand regulations.

### The DayJet Strategy

DayJet's strategy capitalizes on converging social trends, regional business travel dynamics, and technological innovations to create a new category of utilitarian on-demand jet travel.

DayJet employs a disciplined business model that embodies four key principles:

1. The company's "Per-Seat, On-Demand" model is based on operating a larger fleet of smaller aircraft. Rather than operating a few very expensive aircraft, as in most traditional air charter/air taxi operations, DayJet will operate an extensive fleet of affordable Eclipse 500 jet aircraft.
2. DayJet's "Per-Seat, On-Demand" model will operate within strictly defined regional boundaries, unlike traditional on-demand operations where aircraft can fly virtually anywhere, creating unbounded back-haul costs and un-aggregated demand. Business travelers will be able to fly point-to-point to and from airports within the network area on a "per-seat" basis with full and equal peer-to-peer connectivity.

*"DayJet will take the hassle out of regional business travel and allow me to be more effective on the job by getting me to where my customers are more efficiently. DayJet will enable me to respond with greater agility to new market opportunities by making it easier for me to make those last-minute meetings I couldn't before."*

Georg Domenig  
Projects Manager, Grass America  
Takes 12 regional trips a year



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## About DayJet Corporation

3. DayJet will offer a standardized service, focusing on cost-effective, 'no frills' transportation. The company's core value proposition is centered on the utilitarian use of on-demand jet travel to maximize the time and efficiency of mobile workforces — not on catering to luxury and whims.

4. Finally, the DayJet strategy employs 100 percent automation of scheduling and planning. All core decision making is delegated to the company's real-time air logistics, flight scheduling and optimization engine. A skilled staff of DayJet flight operations personnel will review the daily operating plans and handle exceptions. DayJet views this as a necessary condition to scale

### Taking Flight in 2006

DayJet's first flights will take place mid next year, soon after the company takes delivery of its first Eclipse 500 jets and subject to receipt of the necessary government operating authority.

By the end of its second year of operation, DayJet plans to serve in excess of 35 markets with "Per-Seat, On-Demand" services. As the service spreads and as more people experience the efficiency of this new type of regional transportation, a vast new industry will be created, and we'll wonder how we ever got around small regional markets without it.



*"Some of our biggest business opportunities are in hard-to-reach locations that may only have one or two scheduled flights a day. DayJet will make it easy to get to these places fast, increasing our ability to visit clients and branch office employees more often, and more effectively. Today, I spend up to 40 hours driving to regional business trips each month. DayJet on-demand jet service could replace half of my driving trips. I'm definitely looking forward to trying DayJet as soon as it's available in my market."*

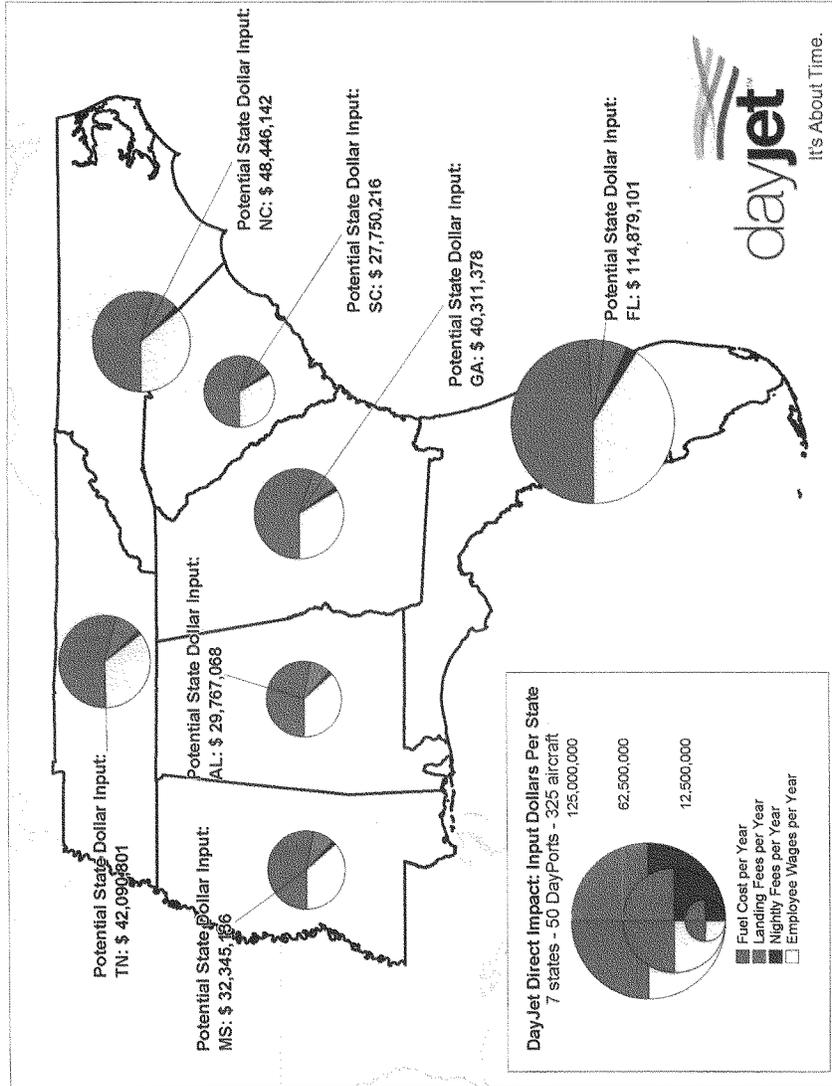
Shawn McGregor  
Director of Marketing, Home LLP  
Takes 15 regional trips a year

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**Appendix C: Graphics**

1. DayJet Direct Economic Impact Chart
2. Example of Potential DayPorts (Iowa)
3. Eclipse 500 schematics
4. Eclipse 500 Interior Passenger seating (DayJet)









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