

**COMMERCIAL SPACEPORT DEVELOPMENT – A CASE STUDY IN
EFFECTIVE PUBLIC / PRIVATE PARTNERSHIP**

Charles J. Lauer
Rocketplane Global, Inc. Lansing MI USA
clauer@rocketplane.com

Misuzu Onuki
Space Frontier Foundation, Tokyo, Japan,
Mszmail@aol.com

George D. French
Rocketplane Global, Inc. Green Bay WI USA
gfrench@rocketplane.com

Lawrence J. Austin
Starwalker Group LLC Alexandria, VA USA
austinesq@aol.com

ABSTRACT

Since the opening of commercial human spaceflight opportunities in 2001 with the twin breakthroughs of the Dennis Tito flight to the International Space Station and the Ansari family funding the \$10 million X Prize, many different venture companies have been developing new fully reusable suborbital space vehicles for the space tourism market and other applications. In almost every instance, the entrepreneurial vehicle development and operating companies are partnering with a public sector entity to develop the spaceport location from which the vehicles will fly. The development synergies and activities of Rocketplane Global, Inc. (RGI) and the Oklahoma Space Industry Development Authority (OSIDA) will be discussed in this paper as a successful case study in PPP. In addition to providing, improving and operating facilities, tax and financial incentives for the creation on new high-tech aerospace jobs were also used. This business model is now being applied by RGI in the beginning of the development of secondary spaceport sites for the XP, both in the US and abroad. Additional RGI spaceport sites now in the early stages of development in Hawaii and Hokkaido Japan will be described. More than a dozen states in the US and more abroad are now also trying to develop new space tourism business opportunities with different vehicle companies and different PPP techniques and tools. A general survey of the competitive landscape for commercial spaceports around the world and their key development strategies and features of each will be provided.

INTRODUCTION

Rocketplane Global (RGI) is one of the leading new suborbital spaceplane development and operations companies, based in Oklahoma City, OK. The XP

spaceplane is a horizontal takeoff and landing vehicle which uses conventional afterburning turbojets for takeoff and landing operations and a LOX / kerosene rocket engine for the ascent to space. The home base for RGI is the Oklahoma

Spaceport, which has been developed by the Oklahoma Space Industry Development Authority (OSIDA) from a former USAF B-52 Strategic Air Command base in western Oklahoma. The existing facilities of the Oklahoma Spaceport are shown in Figure 1 below.



Figure 1. The Oklahoma Spaceport.

The general public / private partnership (PPP) business model for RGI and others is that the private sector develops, tests and operates the vehicles while the public sector develops and operates the spaceport. This business model is very analogous to the way that commercial airports are developed and operated in the US. In the case of the Oklahoma Spaceport, the existing air traffic (civil and military) is maintained while the spaceport operations function as an

overlay use to the existing FAA airport license. The Oklahoma Spaceport received its license from AST (the space licensing division of the FAA) in June 2006.

HISTORICAL BACKGROUND

The Oklahoma Spaceport began life as a Navy pilot training base built during World War II. During the early years of the Cold War many B-52 Strategic Air Command bases were built all over the country as part of the “triad” theory of deterrence including land-based bombers, ballistic missiles and submarines all delivering megatons of thermonuclear hell on Soviet cities. By the late 1960’s an increased emphasis on missile delivery systems resulted in a spate of B-52 base closings. Clinton-Sherman AFB was deactivated in the early 1970’s and turned over to the City of Clinton to be used as an airport industrial airport.

Even though no active duty or Air National Guard squadrons were based there, the 13,500’ x 300’ runway, control tower and crash & rescue unit continued to be maintained under an Air Force service contract so the site could be used as a training facility for the other active duty air bases in Oklahoma and Texas. The flying weather in this part of the US is exceptionally good with over 90% Visual Flying Rules (VFR) days, so there is a lot of pilot training happening all the time. Because the runway is not so busy, it is a good place for planes from other bases to come to in order to practice takeoffs and landings, called touch and goes. This contract activity – managed by the local Development Authority – has kept the facilities in excellent condition all these years.

THE GENESIS OF THE OKLAHOMA
SPACEPORT DEVELOPMENT
CONCEPT

In 1996 NASA initiated a development effort to build a new single-stage-to-orbit space transportation system to replace the Space Shuttle. The plan was for NASA to fund a subscale demonstrator called the X-33 and then have private industry develop and finance the full-scale commercial vehicle. An industry competition was held and Lockheed won the contract. The full-scale vehicle was to be called VentureStar. A comparison of the original designs for the sub-scale and full-scale vehicles is shown in Figure 2 below.

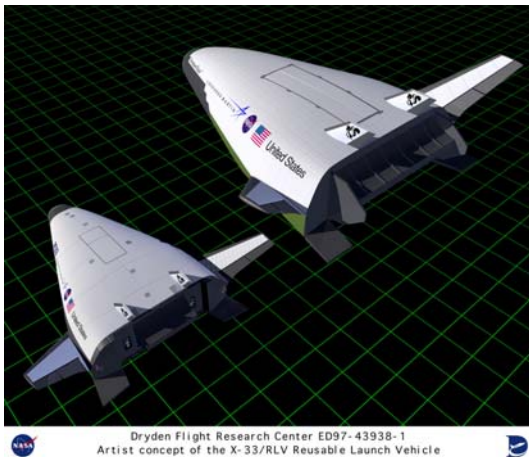


Figure 2. NASA X-33 Program Concept.

A major factor in the selection of Lockheed as the X-33 prime contractor was the company's commitment to invest up to \$5 billion in private capital in the full-scale vehicle following the successful completion of demonstrator program. As part of this private investment commitment, Lockheed began the process of soliciting bids from states interested in become a VentureStar home spaceport. Since the vehicle architecture was vertical takeoff

/ horizontal landing, sites with existing unused or underutilized runways were a particular focus of the site search.

The Oklahoma Aeronautics Commission organized a proposal team to respond to the Lockheed RFP. The team included senior members of the Legislature, Departments of Commerce and Transportation, as well as outside advisors and experts in economic development strategies. The site search selection criteria included facilities and unpopulated areas for launch safety, tax incentives, site plan and building permit approvals and other criteria normally found in any large-scale economic development deal where thousands of jobs are on the table.

Western Oklahoma lost over 5,000 jobs when the B-52 squadrons pulled out of Clinton-Sherman AFB over 20 years before. Several previous attempts to redevelop the facility for commercial air applications had failed, but the desire to bring back new high-paying aerospace jobs to the area had not dimmed. In 1997 the VentureStar RLV appeared to be the "Next BIG Thing" and so the state made a strategic decision to aggressively pursue the VentureStar home port business. As part of the bid response, the Oklahoma Legislature passed two bills. One provided a specific tax credit incentive to Lockheed if they agreed to locate in Oklahoma. The other bill created the Oklahoma Space Industry Development Authority (OSIDA) with a 168 square mile designated Spaceport Territory to operate in, including Clinton-Sherman.

Part of the legislative strategy used in creating OSIDA was to give the Authority full municipal authority,

including being able to issue revenue bonds to finance infrastructure improvements; complete zoning, planning and building permit authority to provide the “one-stop shopping” for all permits; tax-exempt International Trade Zone status, exemption from fuel taxes, and other powers normally granted to municipalities. The legislative model used to create OSIDA was the same one used by the Walt Disney Company to create Lake Buena Vista and of course the Disneyworld developments.

In 1998 the Lockheed site search team had completed its review of all the proposals. A total of 18 states and 35 different sites had been submitted in response to the RFP. The Oklahoma bid team was debriefed and informed that they were ranked about in the middle of the pack. The site itself scored very high, as did the incentive package and general cost structure. However, the location in the central US for an orbital launch vehicle by definition meant launch trajectories had to overfly the densely populated eastern US. The FAA AST launch licensing requirements for protecting people under the flight path of a launch vehicle therefore greatly restricted the available launch azimuths that could be used from Oklahoma. In particular, launches to service the International Space Station (ISS) were problematic because the trajectory had to pass over Chicago.

However, by this time technical problems and cost overruns had started to appear in the subscale X-33 demonstration program. These problems compounded in 1999 with a major failure of a test of the critical composite liquid hydrogen tank. Weight growth

also caused major configuration changes in the full-scale VentureStar so the relationship between the X-33 and the actual commercial vehicle became problematic. The market for commercial satellite launch for the LEO telecom industry had also disappeared by this time, so the business case for the \$5 billion investment in VentureStar became dubious. The X-33 program was ultimately canceled by NASA in 2000 and of course Lockheed did not proceed with the commercial VentureStar program or the development of any commercial spaceports.

ROUND 2 – THE OKLAHOMA SPACEPORT AS A HOME FOR SUBORBITAL TOURIST LAUNCH VEHICLES

One of the features of the OSIDA enabling legislation was that there was a trigger built in to the bill before the Governor would appoint the first OSIDA Board and appropriate and state funds for the Authority. A Letter of Intent from a space transportation company interested in flying from Oklahoma was needed as the first step before the expenditure of any taxpayer money could be justified.

In February 2000 Oklahoma representatives attended the FAA AST conference in Washington with the idea of reaching out to the entrepreneurial sector of the launch vehicle industry. Trying to hit a home run with a “Big Boys” program had not worked, so this strategy seemed like the only chance left if Oklahoma was to realize its vision of developing a commercial spaceport at Clinton Sherman. RGI first became aware of this opportunity to enter into a public private partnership at this event.

An invitation was extended to come to Oklahoma to visit the spaceport site and meet the people involved. In March 2000 the site visit took place, and it made a very positive impression on RGI executives. A Letter of Intent was prepared and signed. This LOI became the basis for the appointment of the first OSIDA Board of Directors by the Governor of Oklahoma and the start of the process of actually creating the Oklahoma Spaceport.

In 2000 and 2001 the market landscape for launch services changed completely. The LEO telecom constellation deployment business model that had been the mainstay of every vehicle developer's business plan had completely evaporated by this time. However, in 2001 Dennis Tito became the first self-financed space tourist and the X Prize Foundation finally received its \$10 million prize purse through the donation of the Ansari family. Developing smaller scale X Prize class suborbital space vehicles for the newly emerging space tourism industry became the replacement market for the now non-existent satellite launch market, and the OSIDA Board members were more than willing to embrace this new market as foundation for space flights from the Oklahoma Spaceport.

THE SB 55 R&D TAX CREDIT FOR NEW REUSABLE SUBORBITAL SPACE VEHICLES

The tax credits that had been passed by the Legislature as part of the VentureStar bid were targeted at Lockheed as large Fortune 500 company. A different approach was needed to assist entrepreneurial space vehicle development companies in raising the

capital needed to develop new reusable launch systems which would fly from the Oklahoma Spaceport. In May 2001 the Oklahoma Legislature passed SB 55 which created a 50% R&D tax credit on up to \$30 million in new investment in suborbital RLV development. A key feature of this bill was that the tax credit was transferrable to third parties which actually had significant tax liability in the state, because a state tax credit is of no value unless it can be applied to taxes owned IN that state. Oklahoma had used this strategy a number of times in other targeted industries, with the banks and insurance companies in Oklahoma usually being the end buyer of the tax credit certificates.

In addition to the critical element of transferability, key features of SB 55 included:

1. A minimum of \$10 million in equity capitalization.
2. A minimum of \$15 million in local contributions to the project.
3. A minimum of \$1.5 million per year in new payroll from the jobs created by the project in Oklahoma.
4. Qualification of the project by the Oklahoma Department of Commerce under the criteria of the Quality Jobs Act.

As soon as SB 55 had been signed into law, it began to receive attention from a variety of NewSpace companies that were interested in using the leverage that could be gained from this tax credit in their financing strategies. A total of 14 companies came to Oklahoma between 2001 and 2003 and signed various agreements and MOU's in pursuit of qualifying for the SB 55 tax credits.

The competition to qualify for the tax credits became known as the “O Prize”. While certainly not as widely publicized as the X Prize, the winning purse was significantly larger and the deadline was a year earlier. RGI succeeded in meeting all of the criteria and qualifying as a Certified Space Transportation Vehicle Provider in late December 2003, literally just before the law creating the tax credit was due to expire. The Tax Credit Certificate was awarded in a ceremony at the State Capitol on January 8, 2004 as shown in Figure 3 below.



Figure 3. Oklahoma SB 55 Tax Credit Award Ceremony.

Once the certificate had been duly awarded it was still necessary to sell it to an Oklahoma business with sufficient tax obligations in the state to fully utilize it. The Bank of Oklahoma was the buyer, and the sale closed in April of 2004. RGI opened its offices in May 2004 and began hiring engineering staff.

THE FAA / AST SPACEPORT LICENSING PROCESS

While the O Prize tax credits were being pursued by a number of companies during 2002 and 2003, OSIDA was receiving appropriations from the state budget each year to obtain approval from the FAA Office of Commercial Space Transportation (FAA / AST) for a

license to operate as a commercial launch site. Several challenges became apparent. First, the FAA / AST office had never licensed an inland spaceport before. All launch operations this far had been from coastal sites. Second, OSIDA management elected to develop a spaceflight operations corridor outside of a restricted Military Operating Area and instead conduct spaceflight operations within the regular national airspace. Third, when the licensing process began there were no clear laws or regulations regarding commercial human spaceflight, and the majority of the flights in the Oklahoma Spaceport business model were intended to be X Prize class suborbital tourist flights. In fact, the X Prize winning flights in the fall of 2004 were licensed under the same regime as a regular satellite launch, and the difficulties with obtaining the licenses in time for the Scaled Composites launch schedule were formidable. The first license literally came in the day before the flight.

The regulatory environment became much clearer in December 2004 when the US Congress passed the Commercial Space Launch Amendments Act. This law authorized the FAA / AST office to promulgate rules for commercial human suborbital spaceflight, with the specific legislative mandate that flights be conducted on a “fly-at-your-own-risk” basis as far as the space tourism customers and crew were concerned. The FAA / AST office was still responsible for ensuring the safety of third parties on the ground under the flight path of a suborbital vehicle as well as compliance with all environmental regulations. However, the FAA / AST office was not required to making any safety certifications on the vehicles or

their passengers. Draft regulations were released for comment in February 2005 and the final rules were adopted in December 2006.

OSIDA staff and their consultants worked diligently on the environmental assessment for the Oklahoma Spaceport as well as coordinating the approval of the spaceflight operations corridor with the airplane side of the FAA – specifically the three Air Traffic Route Centers (ATRC) that shared control of the airspace in the proposed corridor. The spaceflight operations corridor, known as “Infinity One” by the FAA / AST office is shown in Figure 4 below.

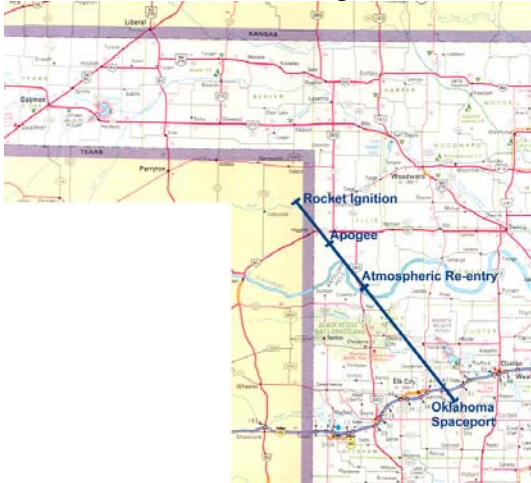


Figure 4. Oklahoma Spaceport Spaceflight Corridor.

It took several years of work and many meetings to finally obtain concurrence from all three ARTC’s for commercial spaceflight operations within the regular national airspace, but the approval was finally obtained after almost four years of effort. The Oklahoma Spaceport received its Launch Site Operator’s License from FAA / AST in June 2006. The total investment by OSIDA and the State of Oklahoma in the licensing effort was close to \$1 million over the four year licensing effort.

ADDITIONAL INFRASTRUCTURE IMPROVEMENTS

Once the license was granted by FAA / AST, the second phase of OSIDA’s development and management of the Oklahoma Spaceport began. First, OSIDA actually took ownership of the 2,700 acres of land which contains the runway, control tower, hangars and vacant land for future industrial and spaceflight operations use. Previously, the property had been owned by the City of Clinton which had received title to the property from the USAF when the base was deactivated. The City of Clinton had set a condition for the transfer of having an approved license.

In the last state budget cycle, an additional \$2 million in funding for infrastructure improvements was also approved. Eight miles of new security fencing was required as a condition of the license, and funding for this was approved. An additional \$1 million was designated for construction of a Mission Control Center in an existing building that now houses the OSIDA offices and educational facilities for the Starbase Academy. High bandwidth downlinks and tracking systems will be installed as well as ground control consoles, media facilities and a Visitor’s Gallery for friends and family of the space tourism customers to enjoy watching the space flights of their loved ones.

Taxpayer investments in new infrastructure are intended to serve any spaceflight operations company flying from the Oklahoma Spaceport, just as airports now serve multiple airline customers. Additional privately owned and operated facilities and infrastructure for individual spaceflight companies can

also be provided in either existing or renovated building at the site, or through the construction of new buildings on the hundreds of acres of available land at the spaceport site.

THE GLOBAL SPACEPORT MARKETPLACE

More than a dozen spaceport development projects have been proposed in the US and abroad in the last few years. Most notable are the Spaceport America project in New Mexico intended to be the home port for Virgin Galactic and the spaceports proposed in Singapore and the United Arab Emirates by Space Adventures in 2006.

The development of Spaceport America was really a top-down decision by the Governor of New Mexico in an attempt to become a leading player in the NewSpace world. New Mexico initially appropriated \$10 million of taxpayer money for the X Prize Foundation as the host for the X Prize Cup, and then leveraged this commitment into negotiating a deal with Virgin Galactic to build a new spaceport from a raw patch of desert next to the White Sands Missile Range. In the last two years, the state and local governments in southeastern New Mexico have appropriated tax revenues and raised local taxes to fund over \$200 million in new infrastructure development including roads, utilities, runways, and a terminal building on the basis of a long-term lease agreement with Virgin Galactic. This is an entirely different scale of public-private partnership from the Oklahoma Spaceport, because everything has to be built from scratch and ultimately all of the infrastructure

cost has to be amortized from the spaceflight operations. This cost burden will be reflected in the overhead structure and operations costs of Virgin and other spaceflight operators that choose to fly there. An artist's rendering of the Spaceport America project is shown in Figure 5 below.



Figure 5. Spaceport America Terminal.

In the US, other states in addition to Oklahoma and New Mexico targeting the space tourism business include Florida, Virginia, California and recently Hawaii. Virginia took a different approach to public-private partnerships by passing a sweeping liability and immunity bill in the legislature intended to attract space tourism operators to its spaceport at Wallops Island, co-located with a NASA facility. Other states are now adopting this Virginia model legislation to provide similar protection against catastrophic lawsuits in the event of an accident involving loss of life during a passenger space flight.

Hawaii is the most recent state to begin the process of obtaining a spaceport license. Hawaii plans to use its existing airport infrastructure to support spaceflight operations rather than build any new facilities. A unique feature of the Hawaii licensing plan is to license the first point-to-point suborbital spaceflight operations corridor between Kona and Oahu. While the distance is only a few hundred miles, it sets the precedent for longer range flights in the future when second generation spaceplanes can begin to make one hour trans-oceanic flights. In fact, this aspect is one of the strategic motivations for Hawaii to develop a commercial spaceport, so that when suborbital spaceflight transitions to longer range vehicles that the state becomes one of the nodes in a network of global spaceports. The proposed Hawaii flight corridor is shown in Figure 6 below.



Figure 6. Spaceport Hawaii Flight Corridor.

On the international front, in addition to Singapore and the U.A.E spaceport proposals, Hokkaido Japan, Kiruna Sweden and most recently Barcelona Spain have all begun the initial feasibility studies for development of commercial spaceports along the same lines as the established US model. Hokkaido actually had developed detailed plans for both an orbital and

suborbital spaceport on the Pacific coast in the southeast Tokachi Prefecture in the 1980's and has been trying to find ways to realize this vision for over 20 years. With the advent of new US suborbital vehicles the vision of a Hokkaido Spaceport may soon be realized. This would provide the Japanese market with magnificent views of the home islands all the way down to Tokyo Bay and Mt. Fuji, as well as all the way across the Sea of Japan to mainland China. A representative view of a 100 km spaceflight from Hokkaido is shown in Figure 7 below.



Figure 7. 100 km view from Hokkaido.

CONCLUSION

The development of suborbital commercial human spaceflight is very capital intensive as well as technically challenging. In almost every case all over the world, the public-private partnership business model has been an essential element of the implementation strategy. Just as airports developed by the public sector lead inevitably to airline service by the private sector, commercial spaceflight operators will need similar support in the development of both physical and regulatory infrastructure and financial incentives to obtain the necessary capital investment.