WEWAK SPACEPORT

welcome center

a steel/membrane structure

Wewak

Coordinates: 3°33′S 143°38′E

Wewak is the capital of the East Sepik province of Papua New Guinea. It is located on the northern coast of the island of New Guinea. It is the largest town between Madang and Jayapura. It is the see city (seat) of the Roman Catholic Diocese of Wewak.

History

Between 1943 and 1945, during World War II, Wewak was the site of the largest Japanese airbase in mainland New Guinea. The base was subjected to repeated bombing by Australian and U.S. planes, most notably in one massive attack on August 17, 1943. Directly to the west of the town centre is a peninsula known as Cape Wom, which was the site of the surrender of Japanese forces in New Guinea, and now houses a small memorial. The Japanese airfield is still used to this day.[1] In August 1945 two war crimes trials were held near Wewak for mutilation and cannibalism. One of the accused was convicted and sentenced to death (later commuted to 5 years imprisonment with hard labour) and the other accused was acquitted.[2]

Wewak

— **Town** —

Location in Papua New Guinea

Coordinates: 3°33′S 143°38′E

Country	Papua New Guinea
Province	East Sepik Province
District	Wewak District
Established	1919
Elevation	16 ft (5 m)
Time zone	AEST (UTC+10)
Main languages	English, Tok Pisin, Kairiru, Boikin

Geography

Wewak city centre and coastline from space

The old centre of the town is situated on a small peninsula, with the rest of the urban area occupying a narrow band of flat land between the ocean and the coastal range of mountains that emerges a short distance inland.

Near Wewak

To the east of the town center is a small peninsula on which is located Boram Hospital,[3] and Wewak International Airport, which is also known as Boram.

Wewak is linked by road to three villages on the Sepik River: Angoram, Timbunke, and Pagui, though the roads are not always in good condition. In addition, a coastal highway extends to the west, linking Wewak with the coastal towns of Aitape and Vanimo, which is the capital of Sandaun province.

References

1. ^ "East Sepik Province Papua New Guinea" (http://www.pacificwrecks.com/provinces/png_east_sepik.html) . Pacific Wrecks. http://www.pacificwrecks.com/provinces/png_east_sepik.html. Retrieved June 6, 2010.
2. ^ Philip Piccigallo: The Japanese on Trial; Austin 1979; ISBN 0-292-78033-8 (Kap. 7 "Australia and Others")
3. ^ "Twenty Gallons of Avgas For Two Lives" (http://www.samaritanaviation.com/index.php/News-/) . Samaritan Aviation. http://www.samaritanaviation.com/index.php/News-/. Retrieved June 6. 2010.

Wewak, Papua New Guinea

Lat: 3.6° S Lon: 143.6° E Elev: **30** ft **2:53 PM PGT on May 11, 2011** (GMT +1000)

Rapid Fire Updates™ Updated 3 hr 2 min 40 sec ago Make this Location a Weather Sticker®

Weather at a Glance

Weather Station	Elevation
Wewak (AYWK)	**30 ft**

Now	Temperature	Wind(mph)	Sunrise / Set	Moon
Partly Cloudy	**88 °F** Feels Like **100** °F	**2**	**6:22** AM **6:20** PM	First Quarter More Astronomy

Today	Tonight	Tomorrow	Friday	Saturday	Sunday
88 °F	75 °F	**86** °F	**86** | 73° F	**86** | 77° F	**88** | 77° F
Partly Cloudy	T-storms 100% chance of precipitation	Chance of T-storms 30% chance of precipitation	Chance of T-storms 50% chance of precipitation	Chance of T-storms 20% chance of precipitation	Chance of T-storms 40% chance of precipitation

Today is forecast to be **nearly the same** temperature as yesterday. 7-Day Forecast - Hourly Details

Current Data | Today's Almanac | Extended Forecast | Radar | **Satellite** | Webcams

Conditions

Pressure	**29.77** in
Visibility	**6.2** miles
Clouds	**Few 2000** ft

Moisture

Humidity	**70**%
Rainfall	**0.00** in
Snow Depth	Not available.

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Weather Radio Index

Temperature

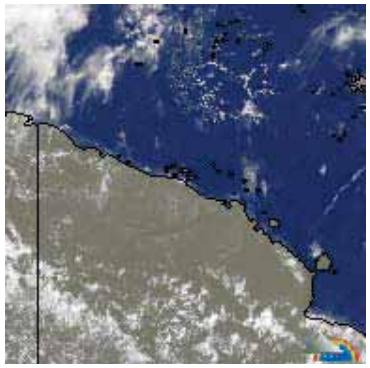
Heat Index	**100** °F
Dew Point	**77** °F

Wind

Speed / Dir	**2** mph from North
Wind Gust	

Health

UV	**10** out of 16
Pollen	Not available.
Air Quality	Not available.
Flu Activity	Not available.



WunderMap®

Forecast

7-Day Forecast for **Wewak** View Calendar

Wewak Information

Wednesday, 11	Thursday, 12	Friday, 13	Saturday, 14	Sunday, 15
88 | 75 °F	**86** | 75 °F	**86** | 73 °F	**86** | 77 °F	**88** | 77 °F
Partly Cloudy	Chance of T-storms	Chance of T-storms	Chance of T-storms	Chance of T-storms
0% Chance of Precipitation	**30%** Chance of Precipitation	**50%** Chance of Precipitation	**20%** Chance of Precipitation	**40%** Chance of Precipitation

Descriptive Forecast Data Source: Weather Underground BestForecast

Wednesday

Partly Cloudy. High: 88 °F. Wind ENE 3 mph. Heat Index: 96 °F.

Wednesday Night

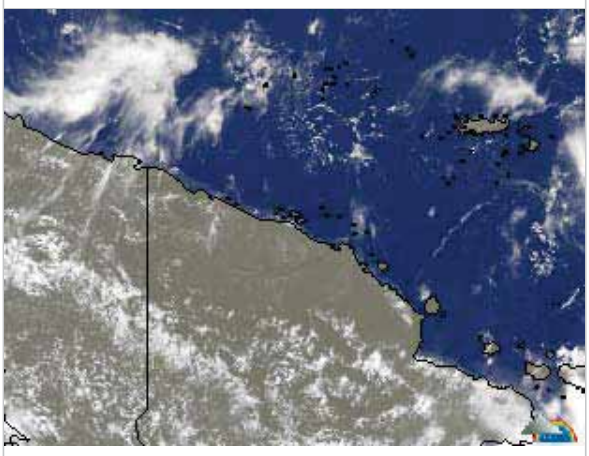
Thunderstorm. Low: 75 °F. Wind ESE 3 mph. 100% chance of precipitation (water equivalent of 0.28 in).

Hourly Forecast	6AM	12 Noon	6PM	12 Midnight
Temp. | Dew Point	**77** | 76	**87** | 72	**81** | 74	**77** | 73
Wind	**2 mph South**	**4 mph South**	**5 mph NNE**	**3 mph ENE**
Humidity	**96**%	**63**%	**79**%	**88**%
Chance of Precip.	**10**%	**0**%	**10**%	**70**%
Cloud Cover	**99**%	**77**%	**65**%	**55**%
Conditions	**Overcast**	**Mostly Cloudy**	**Mostly Cloudy**	**Thunderstorm**
Sunrise & Sunset	**6:22** AM		**6:20** PM	

View Detailed Hourly Forecast Source: Weather Underground BestForecast

Nearby

Maps & Satellite



Regional Satellite Image

Visit Maps & Radar

History & Almanac

Yesterday	**88** °F	**86** °F

Choose a date

May 11 2011 View

Astronomy

May. 11, 2011	Rise	Set
Actual Time	6:22 AM PGT	6:20 PM PGT
Civil Twilight	6:01 AM PGT	6:42 PM PGT
Nautical Twilight	5:36 AM PGT	7:07 PM PGT
Astronomical Twilight	5:10 AM PGT	7:32 PM PGT
Moon	12:51 PM PGT	12:19 AM PGT
Length Of Visible Light	12h 41m	
Length of Day	11h 57m Tomorrow will be **0m 7s shorter**.	

First Quarter, 54% of the Moon is Illuminated

Today	May 17	May 25	Jun 2	Jun 9
First Quarter	Full	Last Quarter	New	First Quarter

Visit Astronomy

Yesterday's Extremes

Country Highs		Country Lows	
Wewak W.O.	**88** °F	Mt Hagen Ats	**62** °F
Wewak	**87** °F	Port Moresby	**75** °F
Port Moresby Airport	**86** °F	Port Moresby Airport	**75** °F
Vanimo	**86** °F	Momote W.O.	**76** °F
Kavieng W.O.	**86** °F	Lombrum	**76** °F

Source WMO

The followings images of Wewak inspired the shape and concept of my Welcome Center. The undulating profile of the steel and membrane structure is meant to mimick the mountain side and offer shelter similar to a tree.

Spaceport

A **spaceport** or **cosmodrome** (Russian: *космодром*) is a site for launching (or receiving) spacecraft, by analogy with seaport for ships or airport for aircraft. The word *spaceport*, and even more so *cosmodrome*, has traditionally been used for sites capable of launching spacecraft into orbit around Earth or on interplanetary trajectories. However, rocket launch sites for purely sub-orbital flights are sometimes called spaceports. In recent years new and proposed sites for suborbital human flights have commonly been named spaceports. Space stations are sometimes called spaceports, in particular if intended as a base for further journeys.

The Baikonur Cosmodrome (Gagarin's Start launch pad)

The term **rocket launch site** is used for any facility from which rockets are launched. It may contain one or more launch pads or suitable sites to mount a transportable launch pad. It is surrounded with large safety area named **rocket range** or **missile range**. The range includes the area over which launched rockets are expected to fly, and within which some components of the rockets may land. Tracking stations, vessels, and aircraft are often located in the range to assess the progress of the launches.

Major spaceports often include more than one **launch complex**, which can be well-separated (for safety reasons) rocket launch sites adapted for different types of launch vehicles. For launch vehicles with liquid propellant, suitable storage facilities and, in some cases, production facilities are necessary. On-site processing facilities for solid propellants are also common.

A spaceport can also include runways for takeoff and landing of spacecraft equipped with wings.

Contents

History

The first rockets to reach space were V-2 rockets launched from Peenemünde in Germany during World War II. When launched vertically they could reach more than 200 km altitude. However, most V-2 rockets reached much lower altitudes on military sorties.

The world's first spaceport for orbital and human launches, the Baikonur Cosmodrome in southern Kazakhstan, started as a Soviet military rocket range in 1955. It achieved the first orbital flight (Sputnik 1) in October 1957. The exact location of the cosmodrome was initially held secret. Guesses to its location were misdirected by a name in common with a mining town 320 km away. The position became known in 1957 outside the Soviet Union only after U-2 planes had identified the site by following railway lines in Kazakhstan, although Soviet authorities did not confirm the location for decades.[1]

The Baikonur Cosmodrome achieved the first launch of a human into space (Yuri Gagarin) in 1961. The launch complex used, Site 1, has reached a special symbolic significance and is commonly called Gagarin's Start. Baikonur was the primary Soviet cosmodrome, and is still widely used by Russia under a lease arrangement with Kazakhstan.

In response to the early Soviet successes, the United States built up a major spaceport complex at Cape Canaveral in Florida. A large number of unmanned flights, as well as the early human flights, were carried out at Cape Canaveral Air Force Station. For the Apollo programme, an adjacent spaceport, Kennedy Space Center, was constructed, and achieved the first manned mission to the lunar surface (Apollo 11) in July 1969. It has been the base for all Space Shuttle launches and most of their runway landings. For details on the launch complexes of the two spaceports, see List of Cape Canaveral and Merritt Island launch sites.

The Guiana Space Centre in Kourou, French Guiana, is the major European spaceport, with satellite launches that benefit from the location 4 degrees north of the equator.

In October 2003 the Jiuquan Satellite Launch Center achieved the first Chinese human spaceflight.

Breaking with tradition, in June 2004 on a runway at Mojave Spaceport, California, a human was for the first time launched to space in a privately funded, suborbital spaceflight, that was intended to pave the way for future commercial spaceflights. The spacecraft, SpaceShipOne, was launched by a carrier airplane taking off horizontally.

Placement considerations

Rockets can most easily reach satellite orbits if launched near the equator in an easterly direction, as this maximizes use of the Earth's rotational speed (465 m/s). Such launches also give a good orientation for arriving at a geostationary orbit. For polar orbits and Molniya orbits this does not apply.

Altitude of the launch site is not a driving factor because most of the delta-v for a satellite launch is spent on achieving the required horizontal orbital speed. The small gains from a few kilometers of extra altitude at the start does not usually off-set the ground transport problems in mountainous terrain.

Many spaceports have been placed at existing military installations, such as intercontinental ballistic missile ranges, which is not always ideal for satellite launches.

A rocket launch site is built as far as possible away from major population centers in order to mitigate risk to bystanders should a rocket experience a catastrophic failure. In many cases a launch site is built close to major bodies of water to ensure that no components are shed over populated areas. Typically a spaceport site is large enough that, should a vehicle explode, it will not endanger human lives or adjacent launch pads.

Planned sites of spaceports for sub-orbital tourist spaceflight often make use of existing ground infrastructure, including runways. The nature of the local view from 100 km altitude is also a factor to consider.

Space tourism

The space tourism industry (see List of private spaceflight companies) is being targeted by spaceports in numerous locations worldwide. The establishment of spaceports for tourist trips raises legal issues, which are only beginning to be addressed.[2][3]

Spaceports with achieved launches of humans

The following is a table of spaceports and launch complexes with a documented achieved launch of humans to space (more than 100 km altitude). Spaceports that have only achieved human sub-orbital flights are listed at the end. Otherwise the sorting order is spaceport by spaceport according to the time of the first human launch.

Spaceport	Launch complex	Launcher	Spacecraft	Flights	Years	Operation
Baikonur Cosmodrome, Kazakhstan	Site 1	Vostok (rocket)	Vostok 1-6	6 Orbital	1961–1963	Governmental
	Site 1	Voskhod (rocket)	Voskhod 1-2	2 Orbital	1964–1965	Governmental
	Site 1, Site 31	Soyuz (rocket)	Soyuz 1-40 †	37 Orbital	1967–1981	Governmental
	Site 1, Site 31	Soyuz (rocket)	Soyuz-T 2-15	14 Orbital	1980–1986	Governmental
	Site 1	Soyuz (rocket)	Soyuz-TM 2-34	33 Orbital	1987–2002	Governmental
	Site 1	Soyuz (rocket)	Soyuz-TMA 1-20	20 Orbital	2002-	Governmental
	Site 1	Soyuz (rocket)	Soyuz TMA-M 1	1 Orbital	2010-	Governmental
Cape Canaveral Air Force Station, USA	LC5	Redstone	Mercury 3-4	2 Sub-O	1961-1961	Governmental
	LC14	Atlas	Mercury 6-9	4 Orbital	1962–1963	Governmental
	LC19	Titan II	Gemini 3-12	10 Orbital	1965–1966	Governmental
	LC34	Saturn IB	Apollo 7	1 Orbital	1968-1968	Governmental
Kennedy Space Center, USA	LC39	Saturn V	Apollo 8-17	10 Lun/Or	1968–1970	Governmental
	LC39	Saturn IB	Skylab 2-4	3 Orbital	1973–1974	Governmental
	LC39	Saturn IB	Apollo-Soyuz	1 Orbital	1975-1975	Governmental
	LC39	STS 1-133 ‡	Space Shuttle	132 Orbital	1981-	Governmental
Jiuquan Satellite Launch Center, China	SLS	Long March 2F	Shenzhou 5-7	3 Orbital	2003-	Governmental
Edwards Air Force Base, USA	Runway	B-52	X-15 90-91	2 Sub-O	1963-1963	Governmental
Mojave Spaceport, USA	Runway	White Knight	SpaceShipOne 15-17	3 Sub-O	2004-2004	Private

† Three of the Soyuz missions were unmanned and are not counted (Soyuz 2, Soyuz 20, Soyuz 34).

‡ STS-51-L (Challenger) failed to reach orbit and is not counted. STS-107 (Columbia) reached orbit and is therefore included in the count (disaster struck on re-entry).

Spaceports with achieved satellite launches

The following is a table of spaceports with a documented achieved launch to orbit. The table is sorted according to the time of the first launch that achieved satellite orbit insertion. The first column gives the geographical location. Operations from a different country are indicated in the last column. A launch is counted as one also in cases where the payload consists of multiple satellites.

Spaceport	Years (orbital)	Launches to orbit or inter-planetary	Launch vehicles (operators)
Baikonur Cosmodrome, Baikonur/Tyuratam, Kazakhstan [4]	1957-	>1000	R-7/Soyuz, Kosmos, Proton, Zenit, Energia
Cape Canaveral Air Force Station, Florida, USA[5]	1958-	>400	Delta, Scout, Atlas, Titan, Saturn, Athena, Falcon 9
Vandenberg Air Force Base, California, USA[6]	1959-	>500	Delta, Scout, Atlas, Titan, Taurus, Athena, Minotaur
Kapustin Yar Cosmodrome, Astrakhan Oblast, Russia[7]	1962-	>100	Kosmos
Hammaguir French Special Weapons Test Centre, Algeria[8]	1965–1967	4	Diamant A (France)
Plesetsk Cosmodrome, Arkhangelsk Oblast, Russia[9]	1966-	>1000	Soyuz, Kosmos
San Marco platform, Broglio Space Centre, Malindi, Kenya[10]	1967–1988	9	Scout (ASI and Sapienza, Italy)
Kennedy Space Center, Florida, USA[5]	1967-	150	17 Saturn, 133 Space Shuttle
Woomera Prohibited Area, South Australia [11]	1967-1971	2	Redstone (WRESAT), Black Arrow (UK Prospero X-3)
Uchinoura Space Center (Kagoshima), Japan[12]	1970–2006	27	Mu
Guiana Space Centre, Kourou, French Guiana [13]	1970-	198	7 Diamant, 9+5+10+113+54 Ariane (CNES, ESA)
Jiuquan Satellite Launch Center, China [14]	1970-	>30	Long March
Satish Dhawan Space Centre (SHAR), Andhra Pradesh, India[15]	1980-	23	3 SLV, 2 ASLV, 14 PSLV, 4 GSLV
Xichang Satellite Launch Center, China [16]	1984-	>40	Long March
Tanegashima Space Center, Japan[17]	1986-	31	9 H-I, 5 H-II, 17 H-IIA
Palmachim Air Force Base, Israel[18]	1988-	6	Shavit
Various airport runways	1990-	37	Pegasus (Orbital Sciences Corporation)
Svobodny Cosmodrome, Amur Oblast, Russia[19]	1997–2006	5	Start-1
Delta class submarine, Barents Sea	1998-	2	Shtil' (Russia)
Ocean Odyssey mobile platform, Pacific Ocean	1999–2009	28	Zenit-3SL (Sea Launch)

Kodiak Launch Complex, Alaska, USA [20][21]	2001-2001	1	Athena
Yasny Cosmodrome (Dombarovsky), Orenburg Oblast, Russia[22]	2006-	4	Dnepr-1
Mid-Atlantic Regional Spaceport (MARS), Virginia, USA[23]	2006-	3	Minotaur I
Taiyuan Satellite Launch Center, China [24]	2007-	4	Long March
Omelek, Marshall Islands	2008-	2	Falcon 1
Semnan, Iran	2009-	1	Safir

The U.S. White Sands Missile Range has had over 7,000 high altitude and sub-orbital flights since 1946 when it sent its first rocket into space.[25] White Sands launches military and civilian flights and serves as an alternate landing site for the space shuttle.

Cape Canaveral Air Force Station

Coordinates: 28°29′20″N 80°34′40″W

Cape Canaveral Air Force Station (CCAFS) is an installation of the United States Air Force Space Command's 45th Space Wing,[3] headquartered at nearby Patrick Air Force Base. Located on Cape Canaveral in the state of Florida, CCAFS is the primary launch head of America's Eastern Range [5] with four launch pads currently active. The facility is south-southeast of NASA's Kennedy Space Center on adjacent Merritt Island, with the two linked by bridges and causeways. The Cape Canaveral AFS Skid Strip provides a 10,000-foot (3,000 m) runway[6] close to the launch complexes for military airlift aircraft delivering heavy and outsized payloads to the Cape.

Several major American space exploration "firsts" were launched from CCAFS, including the first U.S. earth satellite (1958), first U.S. astronaut (1961), first U.S. astronaut in orbit (1962), first two-man U.S. spacecraft (1965), first U.S. unmanned lunar landing (1966), and first three-man U.S. spacecraft (1967). It was also the launch site for the first spacecraft to ever fly past the other planets in the Solar System (1962–1977), the first spacecraft to orbit Mars (1971) and roam its surface (1996), the first American spacecraft to orbit and land on Venus (1978), the first spacecraft to orbit Saturn (2004), and to orbit Mercury (2011).

Cape Canaveral Air Force Station

Part of Air Force Space Command (AFSPC)

U.S. National Register of Historic Places

U.S. National Historic Landmark District

Location:	Cape Canaveral, Florida, USA
Coordinates:	28°29′20″N 80°34′40″W
Area:	1,325 acres (5 km^2) [1]
Built:	1950+[2]
Visitation:	not open to the public ()
Governing body:	US Department of Defense[3]
Added to NRHP:	April 16, 1984
Designated NHLD:	April 16, 1984[4]
NRHP Reference#:	84003872[1]

Contents

History

The CCAFS area had been used by the United States government since 1949 when President Harry S. Truman established the Joint Long Range Proving Grounds at Cape Canaveral to test missiles. The location was among the best in the continental United States for this purpose as it allowed for

launches out over the Atlantic Ocean, and it was closer to the equator than most other parts of the United States, allowing rockets to get a boost from the Earth's rotation.

A Bumper V-2 was the first missile launched at Cape Canaveral, on July 24, 1950.

On June 1, 1948, the U.S. Navy transferred the former Naval Air Station Banana River to the U.S. Air Force, with USAF renaming the facility the Joint Long Range Proving Ground (JLRPG) Base on June 10, 1949. On October 1, 1949, the Joint Long Range Proving Ground Base was transferred from the Air Materiel Command to the Air Force Division of the Joint Long Range Proving Ground. On May 17, 1950, the base was renamed the Long Range Proving Ground Base, but three months later was renamed Patrick Air Force Base, in honor of Army Maj. Gen. Mason Patrick.[7] In 1951, the Air Force established the Air Force Missile Test Center.

Early American sub-orbital rocket flights were achieved at Cape Canaveral in 1956.[8] These flights were shortly after some sub-orbital flights at White Sands, such as Viking 11 on May 24, 1954.[9] Following the Soviet Union's successful Sputnik 1, the US attempted its first launch of an artificial satellite from Cape Canaveral on December 6, 1957. However, the rocket carrying Vanguard TV3 blew up on the launch pad.

NASA was founded in 1958, and Air Force crews launched missiles for NASA from the Cape, known than as Cape Canaveral Missile Annex. Redstone, Jupiter, Pershing, Polaris, Thor, Atlas, Titan and Minuteman missiles were all tested from the site, the Thor becoming the basis for the expendable launch vehicle (ELV) Delta rocket, which launched Telstar 1 in July 1962. The row of Titan (LC-15, 16, 19, 20) and Atlas (LC-11, 12, 13, 14) launch pads along the coast came to be known as **Missile Row** in the 1960s. NASA's early manned spaceflights, Mercury and Gemini, were prepared for launch from Cape launch pads LC-5, LC-14 and LC-19 by U.S. Air Force crews.

In 1963, the installation was renamed Cape Kennedy Air Force Station after the geographic feature's name was changed from Cape Canaveral. In 1973, both names were reverted to Canaveral.

The Air Force chose to expand the capabilities of the Titan launch vehicles for its heavy lift capabilities. The Air Force constructed Launch Complexes 40 and 41 to launch Titan III and Titan IV rockets just south of Kennedy Space Center. A Titan III has about the same payload capacity as the Saturn IB at a considerable cost savings. Launch Complex 40 and 41 have been used to launch defense reconnaissance, communications and weather satellites and NASA planetary missions. The Air Force also planned to launch two Air Force manned space projects from LC 40 and 41. They were the Dyna-Soar, a manned orbital rocket plane (canceled in 1963) and the USAF Manned Orbital Laboratory (MOL), a manned reconnaissance space station (canceled in 1969).

From 1974-1977 the powerful Titan-Centaur became the new heavy lift vehicle for NASA, launching the Viking and Voyager series of spacecraft from Launch Complex 41. Complex 41 later became the launch site for the most powerful unmanned U.S. rocket, the Titan IV, developed by the Air Force.

Facilities

Of the many launch complexes built since 1950, only four remain active with two planned for future use. Launch Complex SLC-17 is the home of the Delta II.[10] Launch Complexes SLC-37 and SLC-41 were modified to launch EELV Delta IV and Atlas V launch vehicles, respectively.[11] These launch

Cape Canaveral Air Force Station

vehicles replaced all earlier Delta, Atlas, and Titan rockets. Launch Complex SLC-47 is used to launch weather sounding rockets. Launch Complex SLC-46 is reserved for future use by the Spaceport Florida Authority.[12] Launch Complex SLC-40 hosted the first launch of the SpaceX Falcon 9 in June 2010.[13]

In the case of low-inclination (geostationary) launches the location of the area at 28°27′N put it at a slight disadvantage against other launch facilities situated nearer the equator. The boost eastward from the Earth's rotation is about 405 m/s (about 900 miles per hour) at Cape Canaveral against about 465 m/s (1,035 miles per hour) at the European Guiana Space Centre in French Guiana.[14]

In the case of high-inclination (polar) launches the latitude does not matter, but the Cape Canaveral area is not suitable because inhabited areas underlie these trajectories; Vandenberg Air Force Base, Cape Canaveral's West coast counterpart, is used instead.

The Air Force Space & Missile Museum is located at LC-26.[15]

Gallery


Cape Canaveral Air Force Station (shown in green)

Map of launch complexes


Cape Canaveral as seen from orbit by a space shuttle in 1991

Looking north along Missile Row in the 1960s

Cape Canaveral lighthouse

MR-3 (first US manned launch) from LC-5 in 1961

Apollo 7/Saturn 1B launch in 1968 from LC-34

Titan III-E launches Voyager 2 probe in 1977 from LC-41

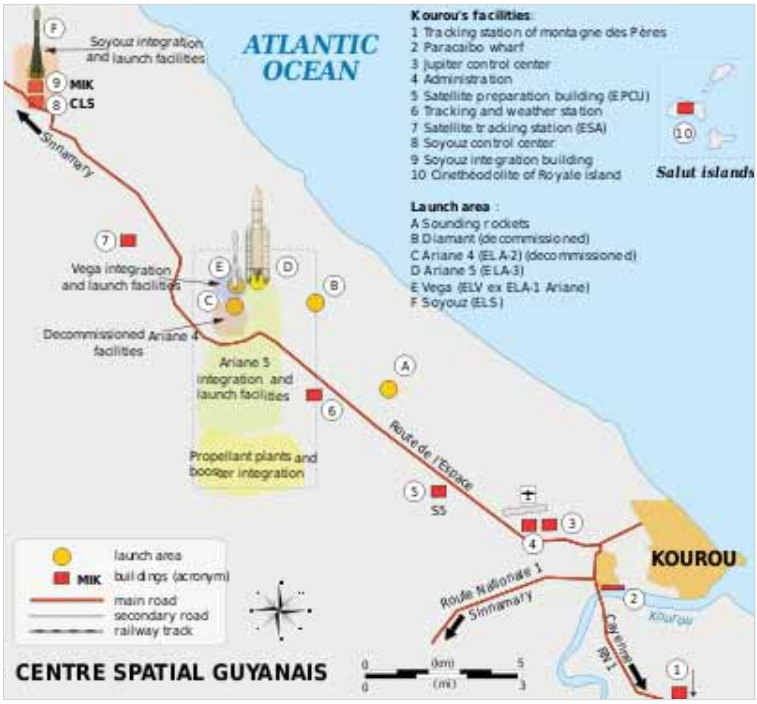
First Delta IV Heavy booster launches from LC-37 in 2007

See also

- List of Cape Canaveral and Merritt Island launch sites

Guiana Space Centre

The **Guiana Space Centre** or, more commonly, **Centre Spatial Guyanais** (CSG) is a French spaceport near Kourou in French Guiana. Operational since 1968, it is particularly suitable as a location for a spaceport due to its proximity to the equator, and that launches are in a favourable direction over water. The European Space Agency, the French space agency CNES, and the commercial Arianespace company conduct launches from Kourou.



Map of Guiana Space Centre

The location was selected in 1964 to become the spaceport of France. When the European Space Agency (ESA) was founded in 1975, France offered to share Kourou with ESA. Commercial launches are bought also by non-European companies. ESA pays two thirds of the spaceport's annual budget, and has also financed the upgrades made during the development of the Ariane launchers.

Contents

Facilities

Kourou is located approximately 500 kilometres (310 mi) north of the equator, at a latitude of 5°10'. At this latitude, the Earth's rotation gives a velocity of approximately 460 metres per second (1,000 mph; 1,700 km/h) when the launch trajectory heads eastward.[1] The proximity to the equator also makes maneuvering satellites for geosynchronous orbits simpler and less costly.

The ground facilities at Guiana Space Centre (GSC) include launcher (French: *l'Ensemble de Lancement*) and satellite preparation buildings, launch operation facilities and a solid propellant factory. The GSC facility covers a total of 850 square kilometres (330 sq mi).

The now-decommissioned *ELA 2* - *l'Ensemble de Lancement Ariane 2* Ariane 4 launch site

ELV (CECLES/ELA-1)

Main article: ELA-1

Originally built in the 1960s under the name of CECLES (French: *Conférence Européenne de Construction de Lanceurs et d'Engins Spatiaux*, English: *European conference on construction of launchers and spacecraft*), the ELV pad (French: *l'Ensemble de Lancement Vega*) located at 5.236°N 52.775°W was designed for the Europa-II rocket. One Europa-II was launched from the site, before the programme was cancelled.

The pad was demolished, and subsequently rebuilt as the first launch complex for Ariane rockets. Renamed *ELA* (later redesignated *ELA 1*), it was used for Ariane 1 and Ariane 2 and 3 launches until being retired in 1989.[2]

As of 2008, ELV-1 is being rebuilt to support launches of the Vega rocket, back under the current designation of ELV.

The final assembly building for Ariane 5

ELA 2

Main article: ELA-2

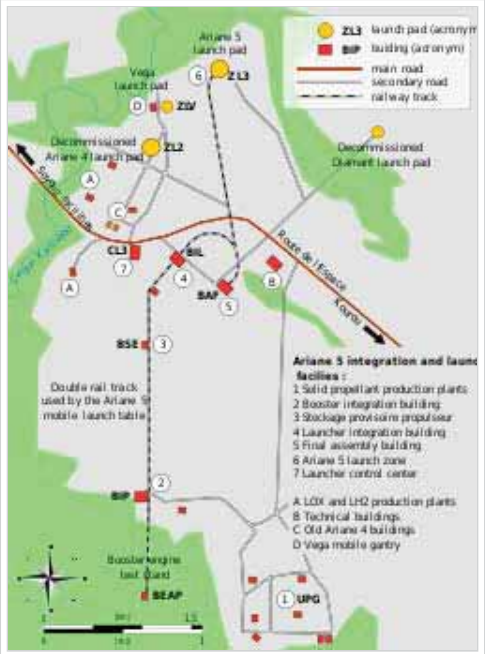
The ELA 2 pad (French: *l'Ensemble de Lancement Ariane 2*), located at 5.232°N 52.776°W had been used for Ariane 4 launches until 2003.

ELA 3

Main article: ELA-3

As of 2008, ELA 3 (French: *l'Ensemble de Lancement Ariane 3*), located at 5.239°N 52.768°W, is currently active for Ariane 5 launches. These facilities cover an area of 21 square kilometres (8.1 sq mi).[3]

ELS / Soyuz at CSG



ELA-3 map

ESA is currently building ELS (French: *l'Ensemble de Lancement Soyouz*) for launching Russian-built Soyuz-2 rockets. The first Soyuz launch from ELS has been postponed several times. The current target date for the first launch is September 2011.[4]

ELS is located on the territory of Sinamary commune, 27 km (17 mi) from Kourou harbor.[5] It is 10 km (6.2 mi) north of the site used for the Ariane 5 launches. Under the terms of the Russo-European joint venture, ESA will augment its own launch vehicle fleet with Soyuz rockets—using them to launch ESA or commercial payloads—and the Russians will get access to the Kourou spaceport for launching their own payloads with Soyuz rockets. Russia will use the Guiana Space Centre in addition to Baikonur Cosmodrome. The Guiana location has the significant benefit of greatly increased payload capability, owing to the near equatorial position. A Soyuz rocket with a 1.7 tonnes to geostationary transfer orbit (GTO) performance from Baikonur, will increase its payload potential to 2.8 tonnes from the Guiana launch site.[6]

The rocket assembly procedures will differ from ones used at Baikonur. Traditionally, the Soyuz is being fully assembled in horizontal position, then transported to a launch pad and erected for launch. In ELS only the rocket will be assembled in horizontal position, then transported and erected. Then a spacecraft will be transported to the pad separately and attached to the rocket. To protect from dust and wind, the launch pad will have a closed gantry. The gantry will be able to move away from the pad for launch.[7]

The ELS project is being co-funded by Arianespace, ESA, and the European Union, with CNES being the prime contractor. The project has a projected cost of approximately €320 million, where €120 million are allocated for modernizing the Soyuz vehicle.[8] The official opening of the launch site construction occurred on 27 February 2007. Excavation work however, had previously begun several months beforehand. As of May 2008, groundworks were still continuing but the flame pit was substantially complete, along with the shell of the Soyuz assembly building. Equipment manufactured in Russia had arrived in French Guiana by July 2008, with Russian technicians performing the equipment installation at ELS.[9]

In November 2007, reports[10] emerged attributed to Vladimir Grezdilov, general director of the Mir company, of thefts from the Soyuz site near Sinnamari, which could cause delays to its completion and the first launches. Grezdilov said that the local security company was involved.

In February 2009 ESA reported from Samara, Russia that the launchers destined for the ELS were being built.[11]

On May 21, 2009 Russian news agency ITAR-TASS reported that the first two Soyuz-ST to be launched at ELS have been built, tested and prepared for delivery to ELS.[12]

On August 25, 2009 the general director of the Progress design bureau Alexander Kirilin said that the first launch of the Soyuz-ST from the Kourou space center was postponed for the beginning of April 2010. He informed that the first three rockets had been built and would be shipped on November 1, 2009 by sea.[13]

On September 13, 2010 Spaceflight Now reported that after several delays in the construction of a mobile gantry the launch pad had been finished, and the first flight of the Soyuz is expected to occur in early 2011.[14] By October 2010, 18 launch contracts have been signed. Arianespace has ordered 24 launchers from Russian industry, with the first two already delivered to CSG.[4]

On January 14, 2011 BBC reported that the Soyuz launch complex will have its qualification review in April with the expectation for the first Soyuz to lift-off sometime between 15 August and 15 September [of 2011].[15]

Final assembly building

Astrium assembles each Ariane 5 launcher in the Launcher Integration Building. The vehicle is then delivered to the Final Assembly Building for payload integration by Arianespace.[16] The Final Assembly Building is located 2.8 kilometres (1.7 mi) from the ELA-3 launch zone. The mobile launch table completes the trip with an Ariane 5 in about one hour. It is then secured in place over the launch pad's flame ducts.[17]

Launch safety

Fire safety is ensured by a detachment of the Paris Fire Brigade. Safety around the base is ensured by French Gendarmerie forces, assisted by the 3rd Foreign Infantry Regiment of the French Foreign Legion.

Before and during launch windows, CSG facility security is significantly enhanced by anti-personnel and anti-aircraft measures, the exact configurations of which are classified by the French military. All entrants to the launch complex are also subject to checks for proof of permission to enter the facility.

The Guiana Space Centre (as per CNES) also holds the *Îles du Salut*, a former penal colony including the infamous Devil's Island. Now a tourist site, the islands are under the launching trajectory for geosynchronous orbit and have to be evacuated during launches.

Ariane IV launched from the Guiana Space Centre on 10 August 1992

Early launches

- 10 March 1970 - The first Diamant-B launched the DIAL/MIKA and DIAL/WIKA satellites. DIAL/MIKA failed during launch, but entered orbit with a total mass of 111 kg.[18] DIAL/WIKA provided data for about two months after launch.[19]

Recent launches

Ariane-5

- 5 October 2007 - An Ariane 5 GS launched from CSG carrying Intelsat 11 and Optus D2.[20]
- 9 March 2008 - An Ariane 5 launched carrying the ATV (Automated Transfer Vehicle) *Jules Verne* in preparation for docking with the ISS. This was the first launch of the ESA unmanned resupply craft.
- 18 April 2008 - An Ariane 5 launched carrying Vinasat-1 - Vietnam's first satellite.
- 14 August 2008 - An Ariane 5 carrying Superbird 7 for Mitsubishi Electric Corporation and AMC-21 for SES Americom
- 20 December 2008 - An Ariane 5 carrying HOT BIRD 9 AND W2M for Eutelsat[21][22]
- 14 May 2009 - An Ariane 5 carrying the ESA's Herschel and Planck space telescopes[23]
- 1 July 2009 - An Ariane 5 carrying TerreStar-1, the heaviest commercial telecommunications satellite ever launched[24]

Kennedy Space Center

The John F. Kennedy Space Center (**KSC**) is the U.S. government installation that manages and operates America's astronaut launch facilities. Serving as the base for the country's three space shuttles, the NASA field center also conducts unmanned civilian launches from adjacent Cape Canaveral Air Force Station (operated by the 45th Space Wing). KSC has been the launch site for every U.S. human space flight since December 1968. Its iconic Vehicle Assembly Building (VAB) is the fourth-largest structure in the world by volume[1] and was the largest when completed in 1965.[2]

Located on Merritt Island, Florida, the center is north-northwest of Cape Canaveral on the Atlantic Ocean, midway between Miami and Jacksonville on Florida's Space Coast. It is 34 miles (55 km) long and roughly 6 miles (10 km) wide, covering 219 square miles (570 km^2). A total of 13,100 people worked at the center as of 2011. Approximately 2,100 are employees of the federal government; the rest are contractors.[3]

STS-60 shuttle launch from Pad 39A on February 3, 1994

All launch operations are conducted at Launch Complex 39 (LC-39), where the shuttle's major components (orbiter, external fuel tank and booster rockets) arrive, are *stacked* (mated) and checked out inside the VAB; then moved to Pad 39A for launch. Shuttles were also launched from adjoining Pad 39B until 2007, when it was modified for the 2009 Ares I-X launch. Both pads are on the ocean, 3 miles (5 km) east of the VAB. The Shuttle Landing Facility, among the longest

John F. Kennedy Space Center

Aerial view of KSC Headquarters looking south

Agency overview	
Formed	July 1962
Preceding agencies	Launch Operations Directorate Launch Operations Center
Jurisdiction	U.S. federal government
Headquarters	Merritt Island, Florida 28°31′26.608″N 80°39′3.055″W
Employees	13,100 (2011)
Annual budget	$217 million USD (2008)
Agency executives	Robert D. Cabana, director Janet E. Petro, deputy director
Parent agency	NASA

Website

NASA KSC home page (http://www.nasa.gov/centers/kennedy/home/index.html)

Map

runways in the world, is just to the north. From 1969–1972, LC-39 was the departure point for all six Apollo manned Moon landing missions using the Saturn V, the largest and most powerful operational launch vehicle in history.

The KSC Industrial Area, where many of the center's support facilities are located, is 5 miles (8 km) south of LC-39. It includes the Headquarters Building, the Operations and Checkout Building and the Central Instrumentation Facility. KSC is also home to the Merritt Island Spaceflight Tracking and Data Network station (MILA), a key radio communications and spacecraft tracking complex. The center operates its own short-line railroad.

KSC shown in white; CCAFS in green

KSC is a major Central Florida tourist destination and is approximately one hour's drive from Walt Disney World and other theme parks in the Orlando area. The Visitor Complex offers public tours of the center and adjacent Cape Canaveral Air Force Station. Because much of the installation is a restricted area and only nine percent of the land is developed, the site also serves as an important wildlife sanctuary; Mosquito Lagoon, Indian River, Merritt Island National Wildlife Refuge and Canaveral National Seashore are other features of the area. Center workers can encounter Bald Eagles, American alligators, wild boars, Eastern Diamondback rattlesnakes, Florida panthers and Florida manatees. KSC is one of ten major NASA field centers, and has several facilities listed on the National Register of Historic Places.

Contents

History

Kennedy Space Center was created and has evolved to meet the changing needs of America's manned space program, initially in competition with the Soviet Union. What is today KSC was authorized in 1958 during the administration of President Dwight D. Eisenhower. The facility was originally known as the **Launch Operations Directorate (LOD)**, reporting to the Marshall Space Flight Center in Alabama.

1960s

President John F. Kennedy's 1961 goal of a lunar landing before 1970 led to an expansion of NASA operations from a few buildings in the Industrial Area of Cape Canaveral Missile Test Annex (later Air Force Station), notably Hangar S, to Merritt Island. NASA began land acquisition in 1962, buying title to 131 square miles (340 km^2) and negotiating with the state of Florida for an additional 87 square miles (230 km^2).[4] The major buildings in KSC's Industrial Area were designed by architect Charles Luckman.[5]

On July 1, 1962, the site was renamed the **Launch Operations Center**, achieving equal status with other NASA centers; and on November 29, 1963, the facility received its current name by Executive Order 11129 following Kennedy's death.[6]

Mercury and Gemini

Main articles: Project Mercury and Project Gemini

The U.S. accomplished a manned lunar landing in three stages—Mercury, Gemini and Apollo. Mercury's objectives were to place a manned spacecraft in earth orbit, investigate human performance and ability to function in space, and safely recover the astronaut and spacecraft. Although Mercury was directed by NASA, launches were from the U.S. Air Force's Cape Canaveral Annex. The first two manned tests used the Redstone booster from LC-5 for the 1961 suborbital flights of Alan Shepard on May 5 (the first American in space) and Gus Grissom on July 21. The first American in orbit, and the first carried by the larger Atlas D rocket, was John Glenn, launched from LC-14 on February 20, 1962. Three more orbital flights followed.

The more complex two-man Gemini spacecraft, and its Titan II booster, based on the military ICBM, helped carry out rendezvous and docking and extra-vehicular activity missions critical for Apollo. Twelve Gemini missions were launched from Cape Canaveral's LC-19, the last ten of which were manned. The first manned flight, Gemini 3, took place on March 23, 1965. The final flight, Gemini 12, launched on November 11, 1966.

Apollo

Main article: Apollo program

The Apollo program required larger launchers—the Saturn family of boosters. The two-stage Saturn I and 1B rockets were erected and launched at the Cape's Launch Complexes 34 and 37. The first Saturn launch, SA-1, came on October 27, 1961 from LC-34. On January 27, 1967, the crew for the first planned manned Apollo mission, AS-204 (also designated Apollo 1), Gus Grissom, Ed White and Roger

Chaffee died by fire on the same pad atop a Saturn 1B; the first spacecraft-related astronaut deaths. After significant changes to the spacecraft, Apollo 7 was launched from LC-34 into earth orbit using a Saturn IB on October 11, 1968.

A Saturn V carrying Apollo 15 rolls out to Pad 39A in 1971 on Mobile Launch Platform 1.

Launch Complex 39

Main article: Kennedy Space Center Launch Complex 39

The VAB (center) in 1999 with the LCC jutting out from its right and Pads A and B in the distance

Missions to the Moon required the large three-stage Saturn V rocket (111 m high and 10 m in diameter). At KSC, Launch Complex 39 (LC-39) was built on Merritt Island to accommodate the new rocket. Construction of the $800 million project began in November 1962. LC-39 pads A and B were completed by October 1965 (a planned Pad C was canceled), the VAB was completed in June 1965, and the infrastructure by late 1966. The complex included a hangar capable of holding four Saturn Vs, the VAB (130 million ft³); a transporter capable of carrying 5,440 tons along a crawlerway to either of two launch pads; and a 446-foot (136 m) mobile service structure. Three Mobile Launch Platforms, each with a fixed launch umbilical tower, were also built. LC-39 also includes the Launch Control Center and a news media site.

From 1967 through 1973, there were 13 Saturn V lift-offs, including the ten remaining Apollo missions after Apollo 7. The first of three unmanned flights, Apollo 4 (Apollo-Saturn 501) on November 9, 1967, was also the first rocket launch from KSC itself. The Saturn V's first manned launch on December 21, 1968 was Apollo 8's lunar orbiting mission. The next two missions tested the Lunar Module: Apollo 9 (earth orbit) and Apollo 10 (lunar orbit). Apollo 11, launched from Pad A on July 16, 1969, made the first Moon landing on July 20. Apollo 12 followed four months later.

1970s

From 1970–1972, the Apollo program concluded at KSC with the launches of missions 13 through 17. On May 14, 1973, the last Saturn V launch put the Skylab space station in orbit from Pad 39A. Pad B, modified for Saturn IBs, was used to launch three manned missions to Skylab that year, as well as the final Apollo spacecraft for the Apollo-Soyuz Test Project in 1975.

In 1976, the VAB's south parking area was the site of Third Century America, a science and technology display commemorating the U.S. Bicentennial, also when the U.S. flag was painted on the building. During the late 1970s, LC-39 was reconfigured to support the Space Shuttle. Two Orbiter Processing Facilities were built near the VAB as hangars with a third added in the 1980s.

1980s–2000s: Space Shuttle

Main article: Space Shuttle program

KSC became the launch site for the Space Shuttle program beginning in 1981. The initial launch, *Columbia* on April 12, 1981, was the first of a vehicle with astronauts aboard which had no prior unmanned launch.

Shuttle *Atlantis* is moved to Pad 39A for the 1990 launch of STS-36.

KSC's 2.9 mile (4.6 km) Shuttle Landing Facility (SLF) is the orbiters' primary end-of-mission landing site, although the first KSC landing did not take place until the tenth flight, when *Challenger* completed STS-41-B on February 11, 1984; the primary landing site until then was Edwards Air Force Base in California, subsequently used as a backup landing site. The SLF also provides a return-to-launch-site (RTLS) abort option, which has not been required.

After 24 successful shuttle flights, *Challenger* was torn apart 73 seconds after the launch of STS-51-L on January 28, 1986; the first shuttle launch from Pad 39B and the first U.S. manned launch failure, killing the seven crew members. An O-ring seal in the right booster rocket failed at liftoff, leading to subsequent structural failures. Flights resumed on September 29, 1988 with STS-26 after extensive modifications to many aspects of the shuttle program.

On February 1, 2003, *Columbia* and her crew of seven were lost during re-entry over Texas during the STS-107 mission (the 113th shuttle flight); a vehicle breakup triggered by damage sustained during launch from Pad 39A on January 16, when a piece of foam insulation from the orbiter's external fuel tank struck the orbiter's left wing. During reentry, the damage created a hole allowing hot gases to melt the wing structure. Like the *Challenger* disaster, the resulting investigation and modifications interrupted shuttle flight operations at KSC for more than two years until the STS-114 launch on July 26, 2005.

The shuttle program has also experienced five main engine shutdowns at LC-39, all within four seconds or less before launch; and one abort to orbit, STS-51F on July 29, 1985. Shuttle missions during nearly 30 years of operations have included deploying satellites and interplanetary probes, conducting space science and technology experiments, visits to the Russian MIR space station, construction and servicing of the International Space Station, deployment and servicing of the Hubble Space Telescope and serving as a space laboratory. The shuttle is scheduled to be retired from service in 2011 after 135 launches.

On October 28, 2009, the Ares I-X launch from Pad 39B was the first unmanned launch from KSC since the Skylab workshop in 1973.

2010s

The planned end of the Space Shuttle program in 2011 is expected to produce a significant downsizing of the KSC workforce similar to that experienced at the end of the Apollo program in 1972. LC-39 would be the launch site for the Ares I and Ares V rockets, which could carry the manned Orion spacecraft by mid-decade if NASA's Constellation program were implemented; although the Obama administration has budgeted instead for a new manned booster developed by the private sector to ferry astronauts into Earth orbit.[7] Pad 39B is currently being dismantled to its base.

Unmanned NASA launches at Cape Canaveral

Pioneer 1 atop its launcher

NASA's first launch, Pioneer 1, came on October 11, 1958 from Cape Canaveral's LC-17A using a Thor-Able booster. The civilian agency has used launch pads at Cape Canaveral AFS ever since for many unmanned launches ranging from satellites to lunar probes, including the Ranger, Surveyor and Lunar Orbiter series during the 1960s.

President Obama and Sen. Bill Nelson arrive at the Shuttle Landing Facility in 2010.

NASA has also launched communications and weather satellites from Launch Complexes 40 and 41, built at the north end of the Cape in 1964 by the Air Force for its Titan IIIC and Titan IV rockets. From 1974–1977 the powerful Titan IIIE served as the heavy-lift vehicle for NASA, launching the Viking and Voyager series of planetary spacecraft and the Cassini–Huygens Saturn probe from LC-41.

NASA currently uses two Cape Canaveral pads: SLC-41 for the Atlas V and SLC-37B for the Delta IV, both for heavy payloads.

Launch Services Program (LSP) is responsible for NASA oversight of launch operations and countdown management for unmmanned NASA launches at KSC.

Weather

Florida's peninsular shape and temperature contrasts between land and ocean provide ideal conditions for electrical storms earning Central Florida the reputation as "lightning capital of the United States".[8][9] This makes extensive lightning protection and detection systems necessary to protect employees, structures and spacecraft on launch pads safe.[10] On November 14, 1969, Apollo 12 was struck by lightning just after lift-off from Pad 39A, but the flight continued safely. The most powerful lightning strike recorded at KSC occurred at LC-39B on August 25, 2006 while shuttle *Atlantis* was being prepared for STS-115. NASA managers were initially concerned that the lightning strike caused damage to *Atlantis*, but none was found.

A Mercury Redstone rocket on display at Gate 3 was toppled by Hurricane Francis on September 7, 2004.

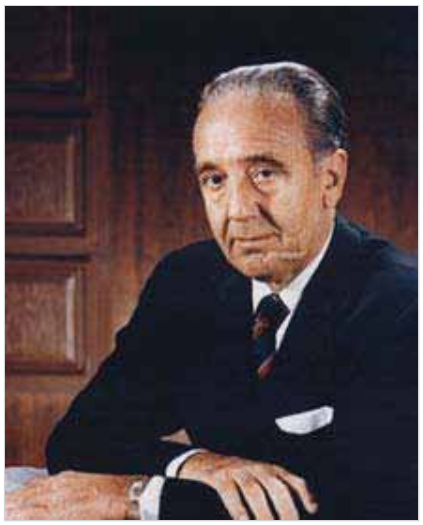
In October 2004, Hurricane Charley caused an estimated $700,000 in damage to KSC. On September 7, 2004, Hurricane Frances directly hit the area with sustained winds of 70 miles per hour (110 km/h) and gusts up to 94 miles per hour (151 km/h), the most damaging storm to date. The Vehicle Assembly Building lost 1,000 exterior panels, each 3.9 feet (1.2 m) x 9.8 feet (3.0 m) in size. This exposed 39,800 sq ft (3,700 m^2) of the building to the elements. Damage occurred to the south and east sides of the VAB. The

shuttle's Thermal Protection System Facility suffered extensive damage. The roof was partially torn off and the interior suffered water damage. Several rockets on display in the center were toppled.[11] Further damage to KSC was caused by Hurricane Wilma in October 2005.

KSC directors

Since KSC's formation, ten NASA officials have served as directors, including three former astronauts (Crippen, Bridges and Cabana):

Name	Start	End	Reference
Dr. Kurt H. Debus	July 1962	November 1974	[12]
Lee R. Scherer	January 19, 1975	September 2, 1979	[13]
Richard G. Smith	September 26, 1979	August 2, 1986	[14]
Forrest S. McCartney	August 31, 1987	December 31, 1991	[15]
Robert L. Crippen	January 1992	January 1995	[16]
Jay F. Honeycutt	January 1995	March 2, 1997	[17]
Roy D. Bridges, Jr.	March 2, 1997	August 9, 2003	[18]
James W. Kennedy	August 9, 2003	January 2007	[19]
William W. Parsons	January 2007	October 2008	[20]
Robert D. Cabana	October 2008	present	[21]


Dr. Kurt Debus, first director of KSC

Labor force

A total of 13,100 people worked at the center as of 2011. Approximately 2,100 are employees of the federal government; the rest are contractors.[22] The average annual salary for an on-site worker in 2008 was $77,235.[23]

Visitor Complex

Main article: Kennedy Space Center Visitor Complex

Mid-Atlantic Regional Spaceport

The **Mid-Atlantic Regional Spaceport** (MARS) is a commercial space launch facility located at the southern tip of NASA's Wallops Flight Facility on the Delmarva Peninsula south of Chincoteague, Virginia.

An aerial view of the launch pads at the Mid-Atlantic Regional Spaceport and NASA's Wallops Flight Facility

Background

In July 2003, Governors Robert Ehrlich of Maryland and Mark Warner of Virginia signed an agreement that directed the Secretary of Commerce and Trade of Virginia and the Secretary of Business and Economic Development of Maryland to form a working group to develop a concept and implementation plan for joint governance, operation and administration of the commercial spaceport at Wallops Island. The spaceport, then known as the Virginia Space Flight Center, had been developed, with a combination of federal, state and private sector funding, by the Virginia Commercial Space Flight Authority (VCSFA).

Launch history

The first rocket to be launched from MARS was an Orbital Sciences Minotaur, at 12:00 GMT on 16 December 2006, with two spacecraft, TacSat-2 for the US Air Force, and GeneSat-1 for NASA.

Launch	Date (UTC)	Vehicle	Payload	Launch pad	Result	Remarks
1	December 16, 2006 12:00	Minotaur I	TacSat-2 / GeneSat-1	Pad 0B	Success	
2	April 24, 2007 06:48	Minotaur I	NFIRE	Pad 0B	Success	
3	August 22, 2008 09:10	ATK ALV X-1	Hy-BoLT and SOAREX VI	Pad 0B	Failure	Went off-course, destroyed by range safety
4	May 19, 2009, 19:55	Minotaur I	TacSat-3	Pad 0B	Success	
Scheduled launches						
	May/June 2011	Minotaur I	USAF ORS-1 Satelitte	Pad 0B		Updated: 2011-05-07
	December 2011	Taurus II	COTS Demo Mission	Pad 0A		Updated: 2011-05-07

	2012	Taurus II	2 ISS re-supply missions	Pad 0A		Updated: 2011-05-07
	May 2013	Minotaur V	LADEE	Pad 0B		Updated: 2011-01-03
	2013	Taurus II	2 ISS re-supply missions	Pad 0A		Updated: 2011-01-03
	2014	Taurus II	2 ISS re-supply missions	Pad 0A		Updated: 2011-01-03
	2015	Taurus II	2 ISS re-supply missions	Pad 0A		Updated: 2011-01-03

Links

- Mid-Atlantic Regional Spaceport Launch Pad 0
- Mid-Atlantic Regional Spaceport web site (http://www.marsspaceport.com/)
- Mid-Atlantic Regional Spaceport Implementation Plan, April 2004 (http://www.mistusa.net/governor_report.pdf)
- Wallops Flight Facility site (http://www.nasa.gov/centers/wallops/home/)
- Orbital Sciences Corporation
- 2010 in spaceflight
- 2011 in spaceflight
- 2012 in spaceflight

Satish Dhawan Space Centre

The **Satish Dhawan Space Centre (SHAR) (सतीश धवन अंतरिक्ष केंद्र, సతీష్ ధావన్ అంతరిక్ష కేంద్రం)** is the launch centre for the Indian Space Research Organisation (ISRO). It is located in Sriharikota, Andhra Pradesh, India,80 km (50 mi) north of Chennai in South India. It was originally called *Sriharikota High Altitude Range (SHAR)*, and was sometime known as *Sriharikota Launching Range*. The centre was renamed to its present name in 2002 after the death of ISRO's former chairman Satish Dhawan. The space centre has kept the title **SHAR** during these name changes.

Contents

Satish Dhawan Space Centre (SDSC)
सतीश धवन अंतरिक्ष केंद्र

An aerial view of Satish Dhawan Space Centre.

Agency overview	
Formed	October 1, 1971
Jurisdiction	Indian federal government
Headquarters	Sriharikota, Andhra Pradesh, India 13°43′12″N 80°13′49″E
Employees	Unknown (2008)
Annual budget	See the budget of ISRO
Parent agency	ISRO
Website	
[4] (http://www.shar.gov.in/Main.html) ISRO SHAR home page	

History

The centre became operational 1971 when an RH-125 sounding rocket was launched.[1] The first attempted launch of an orbital satellite, Rohini 1A aboard a Satellite Launch Vehicle, took place 10 Aug 1979, but due to a failure in thrust vectoring of the rocket's second stage, the satellite's orbit decayed 19 Aug 1979.[2]

The SHAR facility now consists of two launch pads, with the second built recently. The second launch pad was used for launches beginning in 2005 and is a universal launch pad, accommodating all of the launch vehicles used by ISRO. The two launch pads will allow multiple launches in a single year, which was not possible earlier. India's lunar orbiter Chandrayaan 1 launched from the centre at 6:22 AM IST on 22 October 2008.

SHAR will be the main base for the Indian human spaceflight program. A new third launchpad will built specifically to meet the target of launching a manned space mission by 2015.[3]

Location

Satish Dhawan Space Centre SHAR, located at Sriharikota, a spindle shaped island on the East Coast of Andhra Pradesh, adjacent to Sricity, a developing satellite city in the epicentre of Andhra Pradesh & Tamil Nadu, about 70 km (43 mi) north of Chennai, is the spaceport of India. This island was chosen in 1969 for setting up of a satellite launching station. Features like a good launch azimuth corridor for various missions, advantage of earth's rotation for eastward launchings, nearness to the equator, and large uninhabited area for the safety zone — all make Sriharikota Range, popularly known as 'SHAR', an ideal spaceport. Off naidupet a big town in Nellore district, Andhra Pradesh on the national highway connecting Chennai and Kolkata — a 20-minute drive towards the east on the road laid across the Pulicat Lake takes one to Sriharikota. SHAR was named as 'Satish Dhawan Space Centre SHAR' (SDSC), on 5 September 2002, in memory of Prof Satish Dhawan, former Chairman of the ISRO.

SHAR covers a total area of about 145 km^2 (56 sq mi) with a coastal length of 27 km (17 mi). Prior to its acquisition for ISRO by the Indian Government, its was a firewood plantation of Eucalyptus and Casuarina trees. This island is affected by both south-westerly and north-easterly monsoons, but heavy rains come only in October and November. Thus many clear days are available for out-door static tests and launchings.[4]

Launch History

Originally known as the Sriharikota Range (SHAR) and later named after Satish Dhawan, it is India's primary orbital launch site to this day. The first flight-test of 'Rohini-125', a small sounding rocket which took place on October 9, 1971 was the first ever spaceflight from SHAR. Since then technical, logistic and administrative infrastructure have been enhanced. Together with the northerly Balasore Rocket Launching Station, the facilities are operated under the ISRO Range Complex (IREX) headquartered at SHAR.[5]

Satellite Launch Vehicle (SLV)

The range became operational when three Rohini 125 sounding rockets were launched on 9 and 10 October 1971. Previously, India used Thumba Equatorial Rocket Launching Station (TERLS), on the west coast of India, to launch sounding rockets. The first test launch of the complete SLV-3 rocket occurred in August 1979 but it was only partially successful following a malfunction in the second stage guidance system. SHAR facilities worked satisfactorily during the SLV-3 preparation and launch. On 18 July 1980 the SLV-3 successfully launched India's third satellite. Out of the four SLV launches from SHAR, two were successful.

Augmented Satellite Launch Vehicle (ASLV)

The ASLV orbital launcher was integrated vertically, beginning with motor and subassembly preparations in the Vehicle Integration Building (VIB) and completed on the pad within the 40 m tall Mobile Service Structure. The first ASLV launch from SHAR took place in 1987 and resulted in a failure. Eventually, out the four ASLV launches from 1987–94, only one was successful.

Polar Satellite Launch Vehicle (PSLV)

The PSLV launch complex was commissioned during 1990. It has a 3,000 tonne, 76.5 m high Mobile Service Tower (MST) which provides the SP-3 payload clean room. The solid propellant motors for the PSLV are processed by SHAR, which also carries out launch operations. The first launch of the PSLV took place on 20 September 1993. Since then out of 15 launches, PSLV has a recorded 14 successes. PSLV is launched both from the first and the second launch pad.

Facilities

The Centre has two operational orbital launch pads. SHAR is ISRO's satellite launching base and additionally provides launch facilities for the full range of Rohini sounding rockets. The Vehicle Assembly, Static Test and Evaluation Complex (VAST, previously STEX) and the Solid Propellant Space Booster Plant (SPROB) are located at SHAR for casting and testing solid motors. The site also has a Telemetry Tracking & Control centre, the Management Service Group and Sriharikota Common Facilities. The PSLV launch complex was commissioned in 1990. It has a 3,000 tonne, 76.5 m high Mobile Service Tower (MST) which provides the SP-3 payload clean room.[6]

The solid propellant space booster plant(SPROB) processes large size propellant grains for the satellite launch vehicles. The Static Test & Evaluation Complex (STEX) tests and qualifies different types of solid motor for launch vehicles. The closed center at SHAR houses computers and data processing, closed circuit television, real-time tracking systems and meteorological observation equipment. It is linked to three radars located at Sriharikota and the five stations of ISRO's Telemetry, Tracking & Command Network (ISTRAC).

The propellant production plant produces composite solid propellant for rocket motors of ISRO using ammonium perchlorate (oxidiser), fine aluminium powder (fuel) and hydroxyl terminated polybutadiene (binder). The solid motors processed here include those for the first stage booster motor of the Polar Satellite Launch Vehicle (PSLV) — a five segmented motor of 2.8 m diameter and 22 m length, weighing 160 tons with a thrust level of 450 tons.

Rocket motors and their subsystems have to be rigorously tested and evaluated on ground before they are declared flight worthy. The facilities at SDSC SHAR are used for testing solid rocket motors, both at ambient conditions and simulated high altitude conditions. Besides these, there are facilities for conducting Vibration, Shock, Constant Acceleration and Thermal/humidity tests.

SDSC SHAR has infrastructure for launching satellites into low earth orbit, polar orbit and geo-stationary transfer orbit. The launch complexes provide support for vehicle assembly, fuelling, checkout and launch operations. The Centre also has facilities for launching sounding rockets for atmospheric studies. The mobile service tower, launch pad, preparation facilities for different launch stages & spacecraft, storage, transfer and servicing facilities for liquid propellants, etc., are the principal parts of the PSLV/GSLV launch complex.

For supporting the GSLV Mk III programme additional facilities are being set up at SDSC. A new plant is being set up to process heavier class boosters with 200 tonnes of Solid propellant. The static test complex is being augmented for qualifying the S-200 booster. Other new facilities include a Solid Stage Assembly Building, Satellite Preparation and Filling Facility and Hardware Storage buildings. The existing liquid propellant and cryogenic propellant storage and filling systems, Propellant Servicing Facilities will also be augmented. The range instrumentation system will be enhanced further.

Launchpads

Old Launch Pad (Launch Pad-1)

Main article: Satish Dhawan Space Centre First Launch Pad

This was the first launch pad built at SHAR during the late 1960s. It became operational in 1971 and since then numerous launches have taken place. It is operational even today and is used for PSLV launches.

Second Launch Pad (SLP)

Main article: Satish Dhawan Space Centre Second Launch Pad

The SLP at SHAR is a state-of-the-art launch complex. SLP is configured as a universal launch pad capable of accommodating all the launch vehicles of ISRO including the advanced launch vehicles to be built in the next decade and beyond. It became operational in 2005.

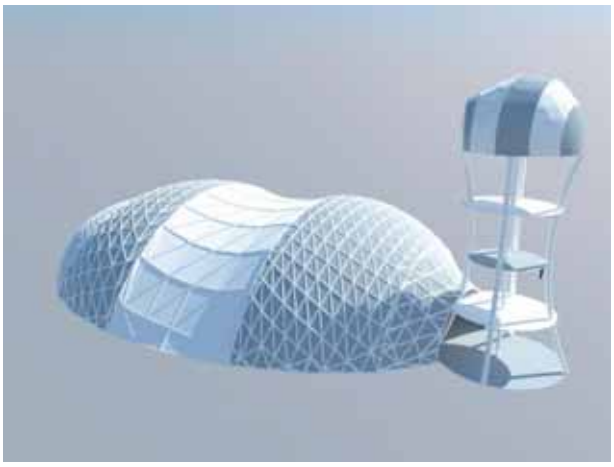
Third Launch Pad

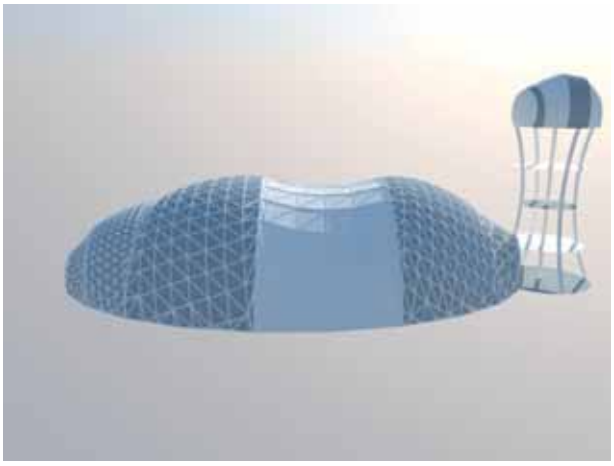
The Third Launch Pad is specifically being built for manned missions at a cost of Rs 600 crores. It is scheduled to be completed by 2012 and the first test flight would take place in 2013.

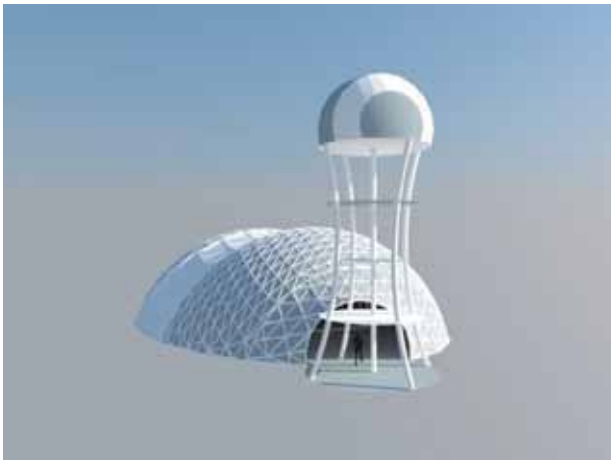
Notable Launches from SHAR

- 1979: First experimental launch of SLV-3 with Rohini satellite on board failed.
- 1980: Second experimental launch of SLV-3 Rohini satellite successfully placed in orbit.
- 1983: Second launch of SLV-3. RS-D2 placed in orbit.
- 1987: ASLV with SROSS-1 satellite on board launched.
- 1992: Third developmental launch of ASLV with SROCC-C on board (May). Satellite placed in orbit. First indigenously built satellite
- 1993: First developmental launch of PSLV with IRS-1E on board fails.
- 1994: Fourth developmental launch of ASLV successful (May). Second developmental launch of Polar Satellite Launch Vehicle (PSLV) with IRS-P2 successfully (October).
- 1995: Third operational IRS (IRS) launched.
- 1996: Third developmental launch of PSLV with IRS-P3 successful (March).
- 1997: First operational launch of PSLV with IRS-1D successful (September).
- 1999: IRS-P4 (OCEANSAT), launched by Polar Satellite launch vehicle (PSLV-C2) along with Korean KITSAT-3 and German DLR-TUBSAT from Sriharikota (26 May 1999).
- 2001: Geosynchronous Satellite Launch Vehicle-D1 (GSLV-D1), the first developmental launch of GSLV with GSAT-1 onboard partially successful.
- 2002: PSLV-C4 launches MetSat-1, later renamed Kalpana-1 (September).

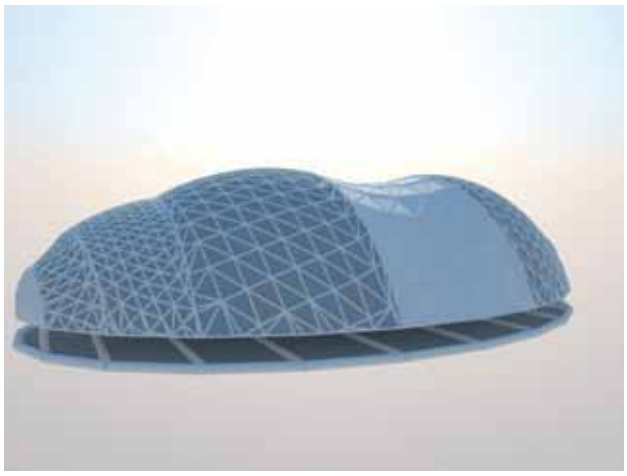
- 2003: GSLV-D2, the second developmental launch of GSLV with GSAT-2 successful (May).
- 2004: First operational flight of GSLV (F01) successfully launches EDUSAT (September).
- 2005: Launch of CARTOSAT and HAMSAT by PSLV-C6 from the second launch pad (Universal Launch Pad) (May).
- 2006: Second operational flight of GSLV (F02) unsuccessful July 10, 2006. GSLV-F02 was carrying INSAT-4C.
- 2007: Successful launch of CARTOSAT-2, SRE-1, LAPAN-TUBSAT and PEHUENSAT-1 on PSLV C7 on January 10, 2007.
- 2007: SRE-1 splashed down in the Bay of Bengal on January 22, 2007 and was successfully recovered by the Indian Coast Guard and Indian Navy, making India one of the few countries to have re-entry technology.
- 2007: PSLV-C8 successfully places an Italian satellite, AGILE into its orbit on April 23.
- 2 September 2007 — GSLV-F04 launched with INSAT 4CR[7]
- 21 January 2008 — PSLV-C10 launches TecSAR.
- 28 April 2008 — PSLV-C-9 launches 10 Satellites successfully (2 Indian + 8 foreign)
- 22 October 2008 — Chandrayaan-1 (Moon Vehicle) spacecraft launched from the Satish Dhawan Space Centre, SHAR, Sriharikota by PSLV-XL (PSLV-C11) in a highly elliptical initial orbit (IO) with perigee (nearest point to the Earth) of about 257 km and an apogee (farthest point from the Earth) of about 22,858 km.

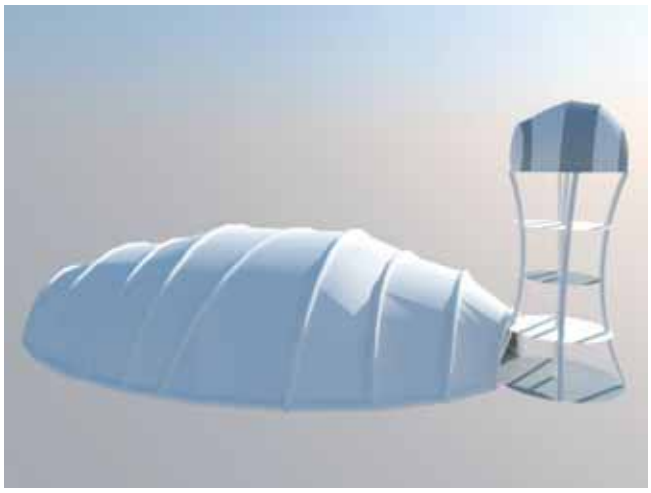


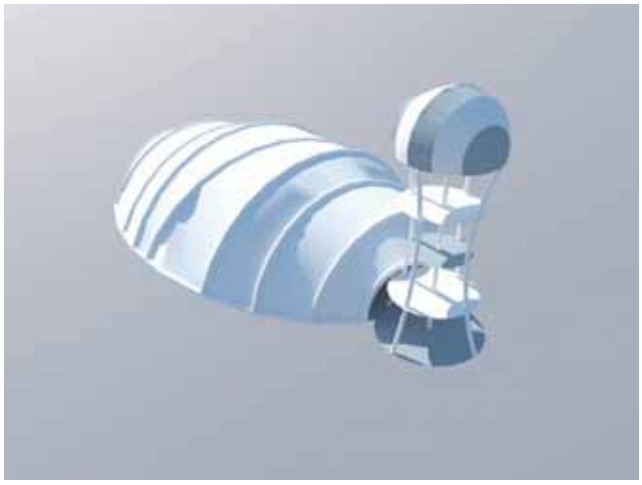




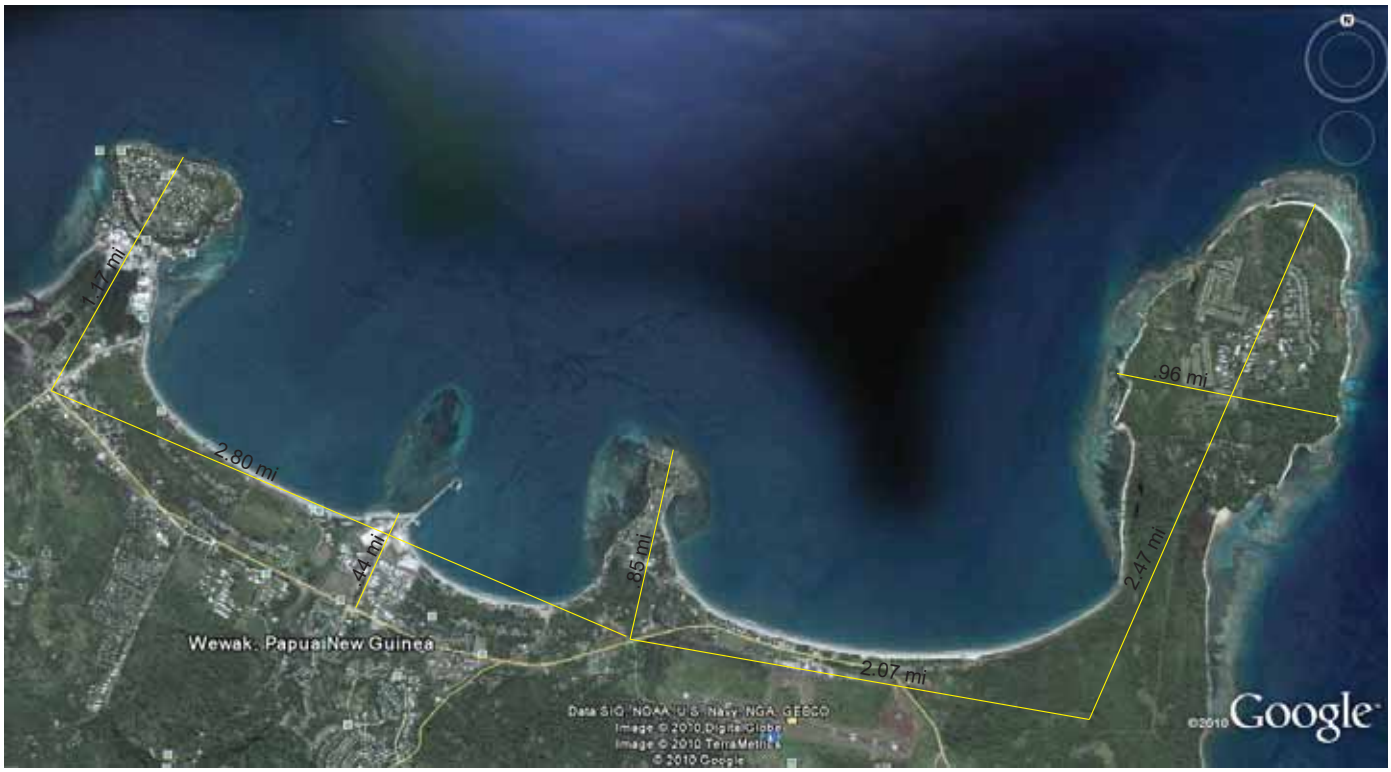
Early Concepts- Phase 1

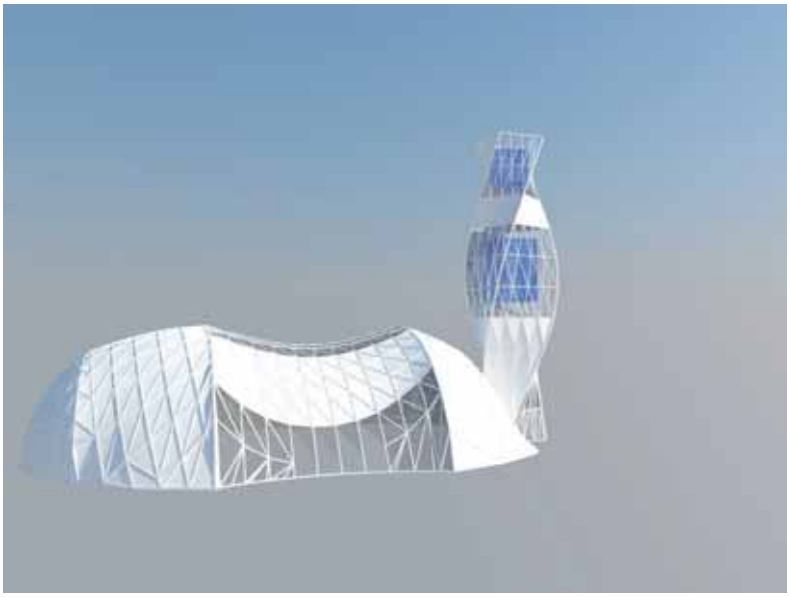




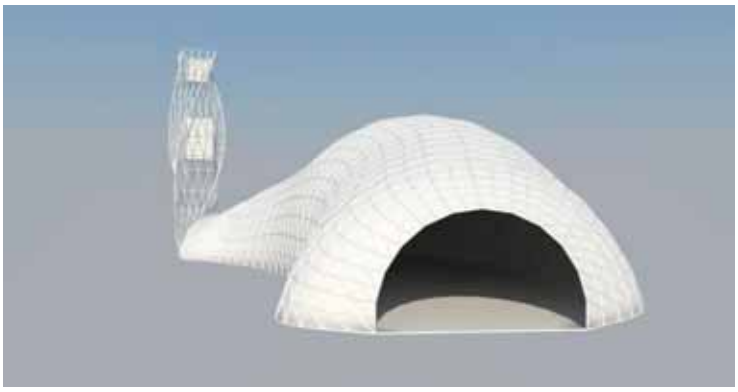


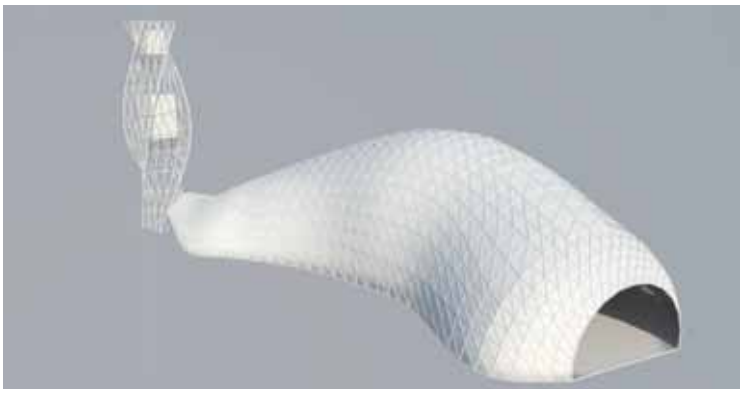
Early Concepts- Phase 1

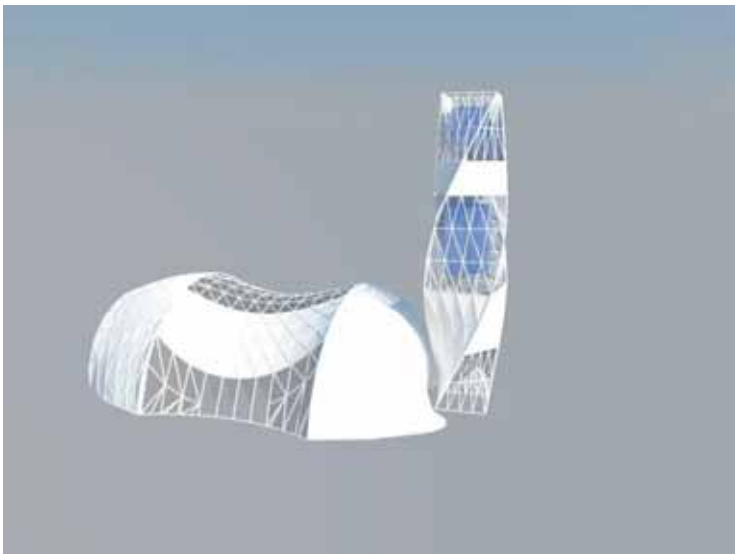




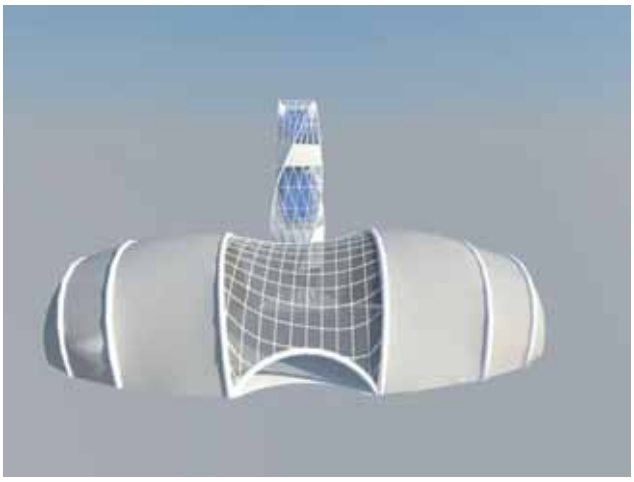
Early Concepts- Phase 2

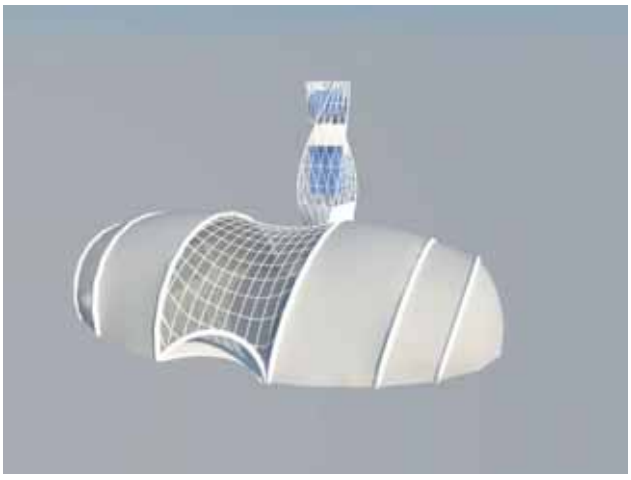


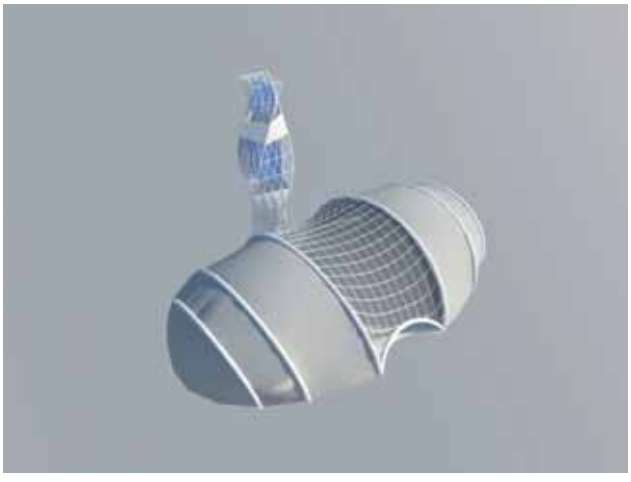




Early Concepts- Phase 2



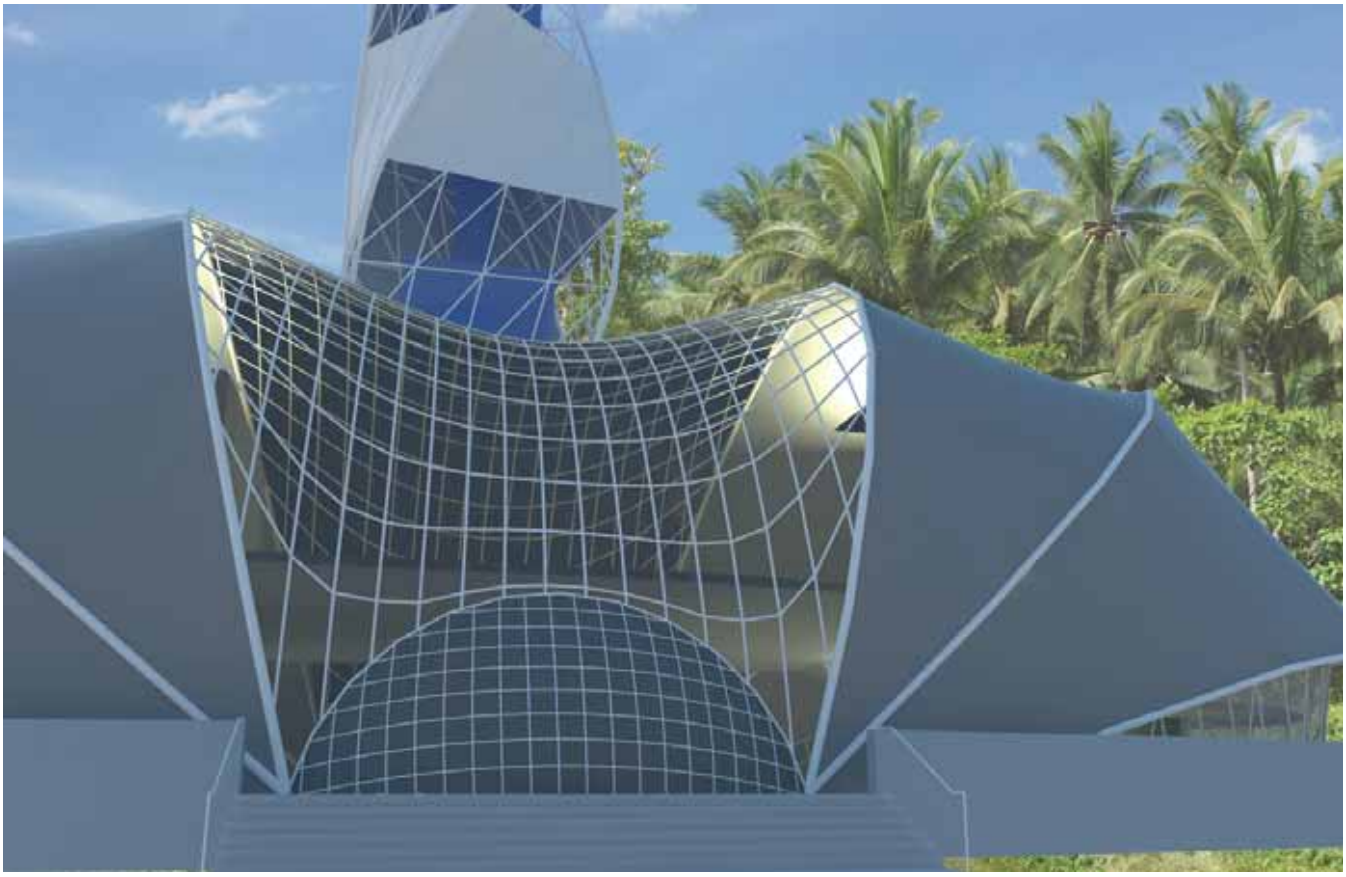




Early Concepts- Phase 2

Fall Final

Fall Final



Fall Final

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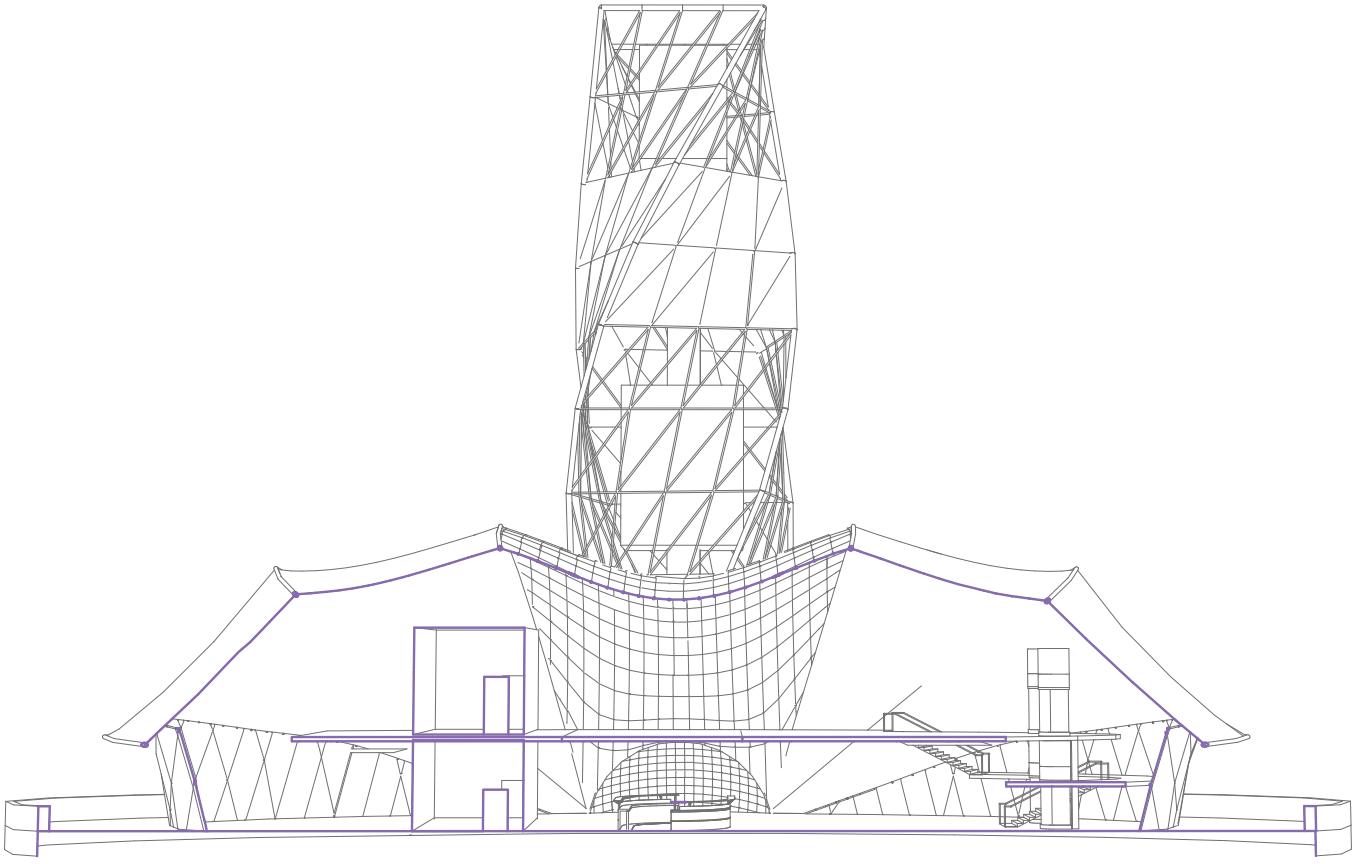

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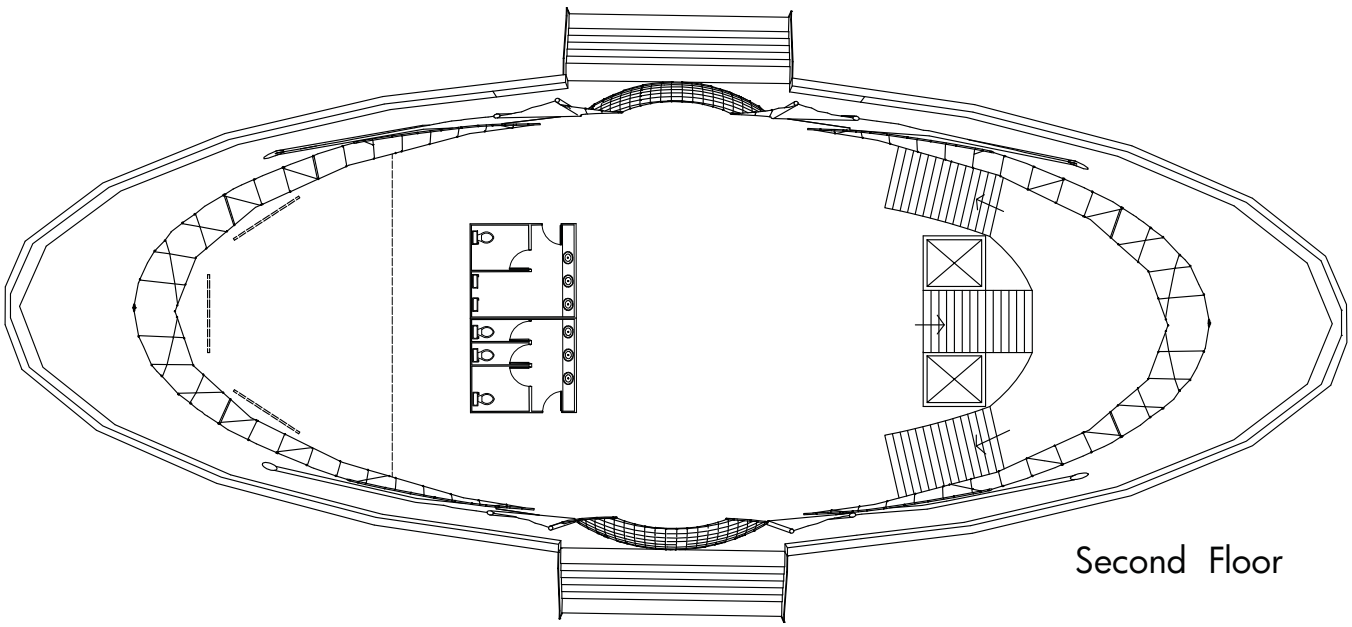
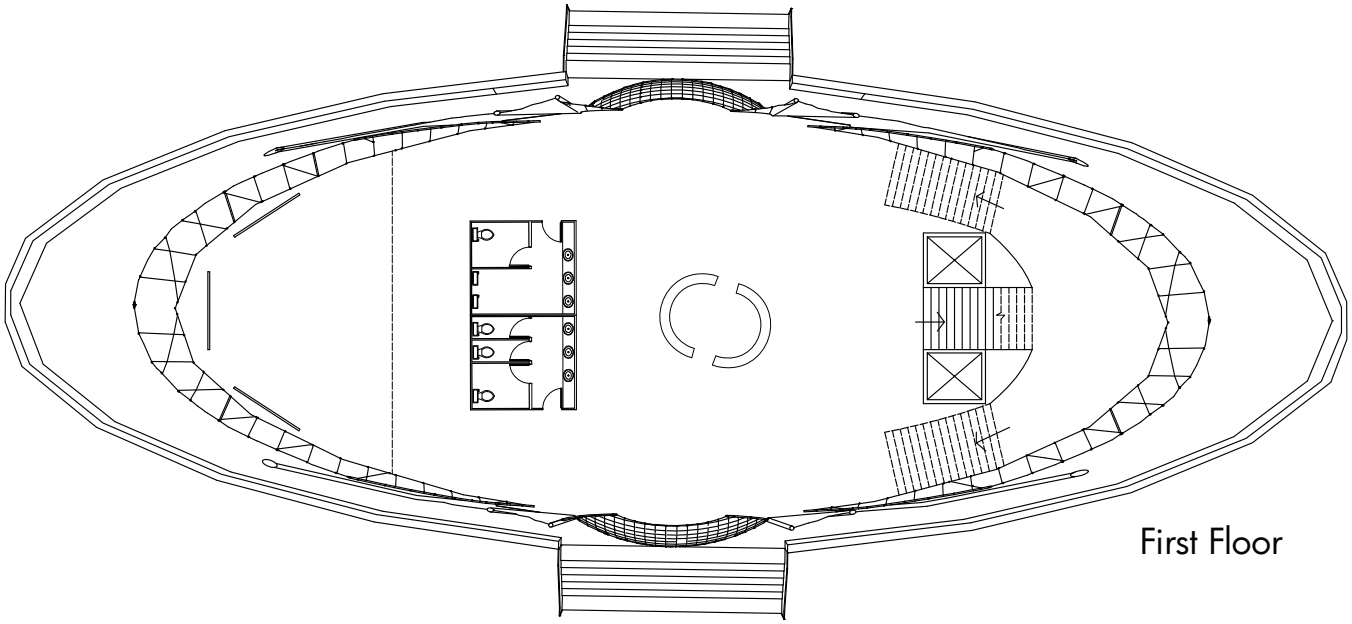


Second Floor



First Floor

Fall Final

BMW Headquarters By COOP HIMMELB(L)AU in Munich, Germany

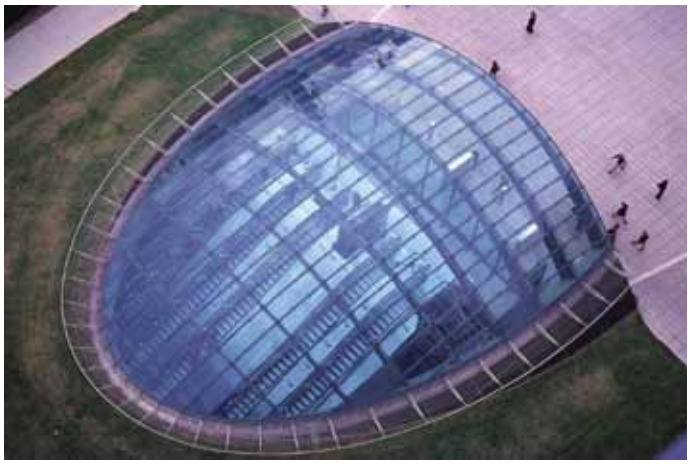
FabriTec Structures

Federation Square Civic Centre Melbourne, Australia

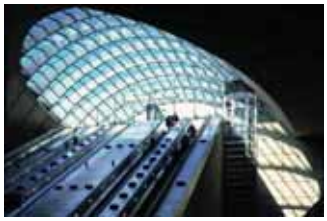
Fiera di Milano Exhibition Centre, Milan, Italy

Further precedent research to refine the overall shape of the building.

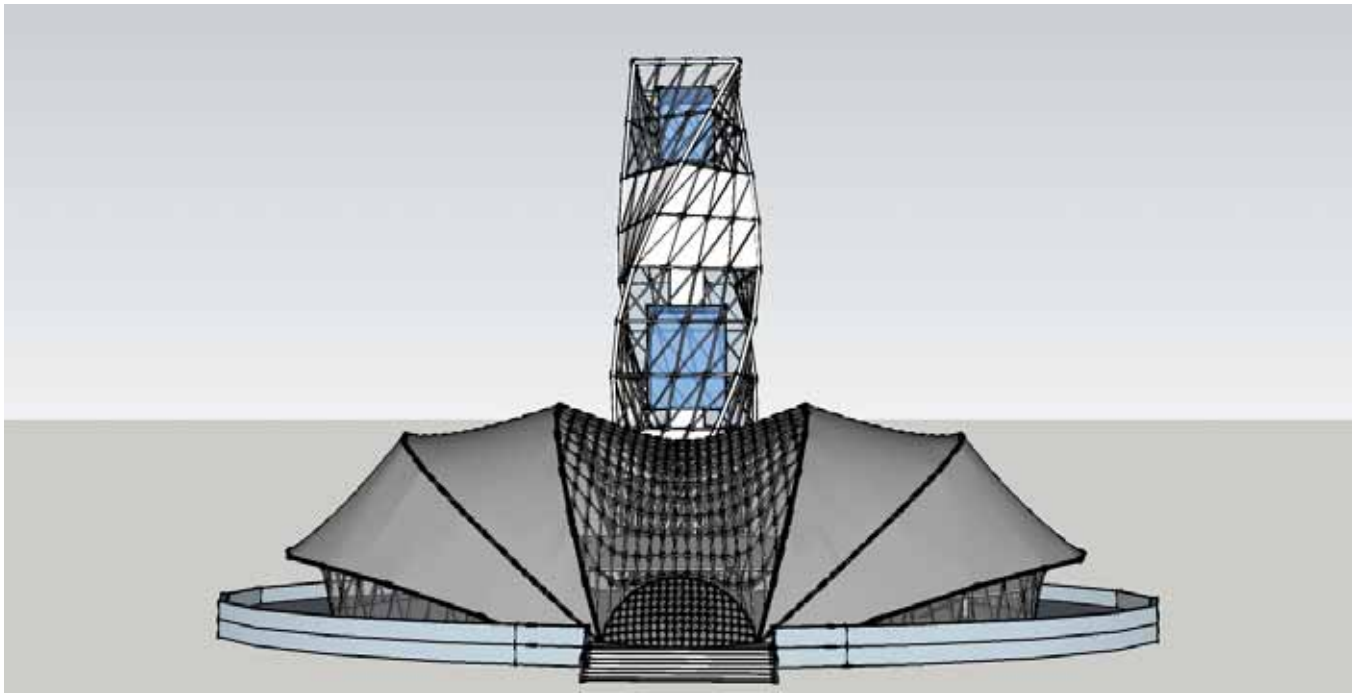
Spring Semester



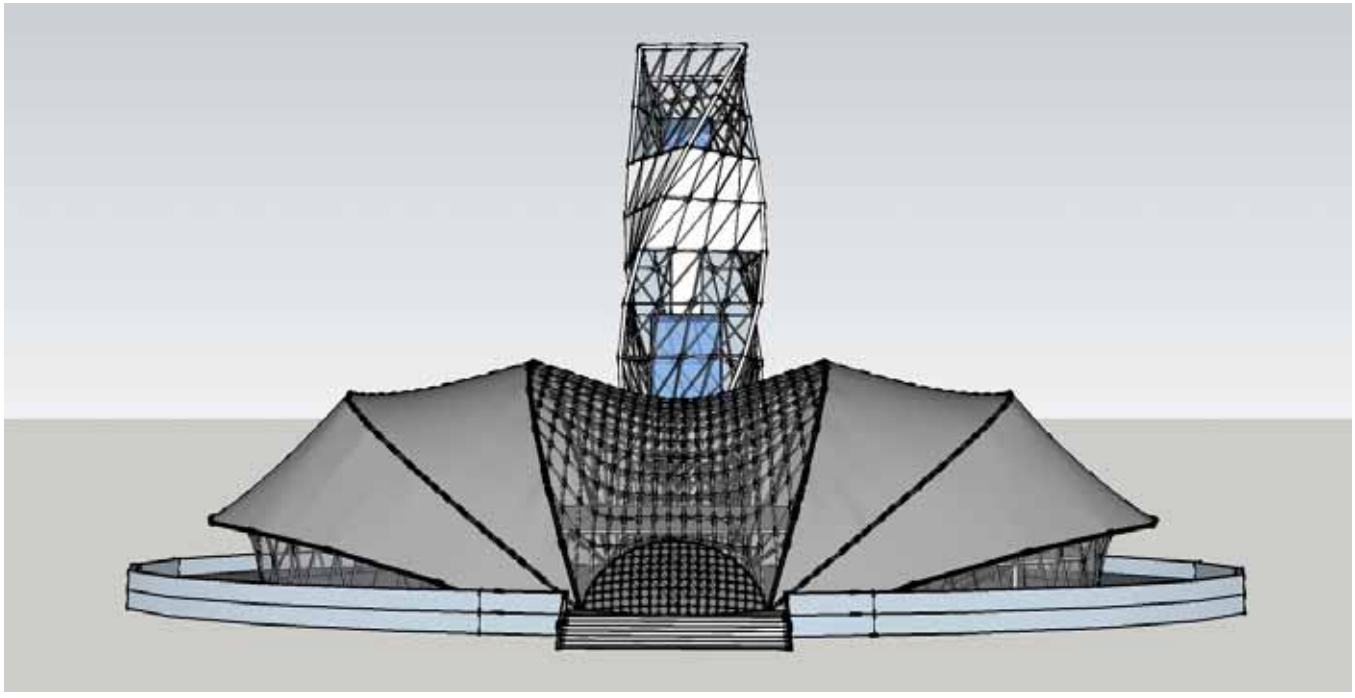
Canary Wharf Underground Station,
London, England- Norman Foster



Vakko Fashion Center, Istanbul, Turkey- REX Architects

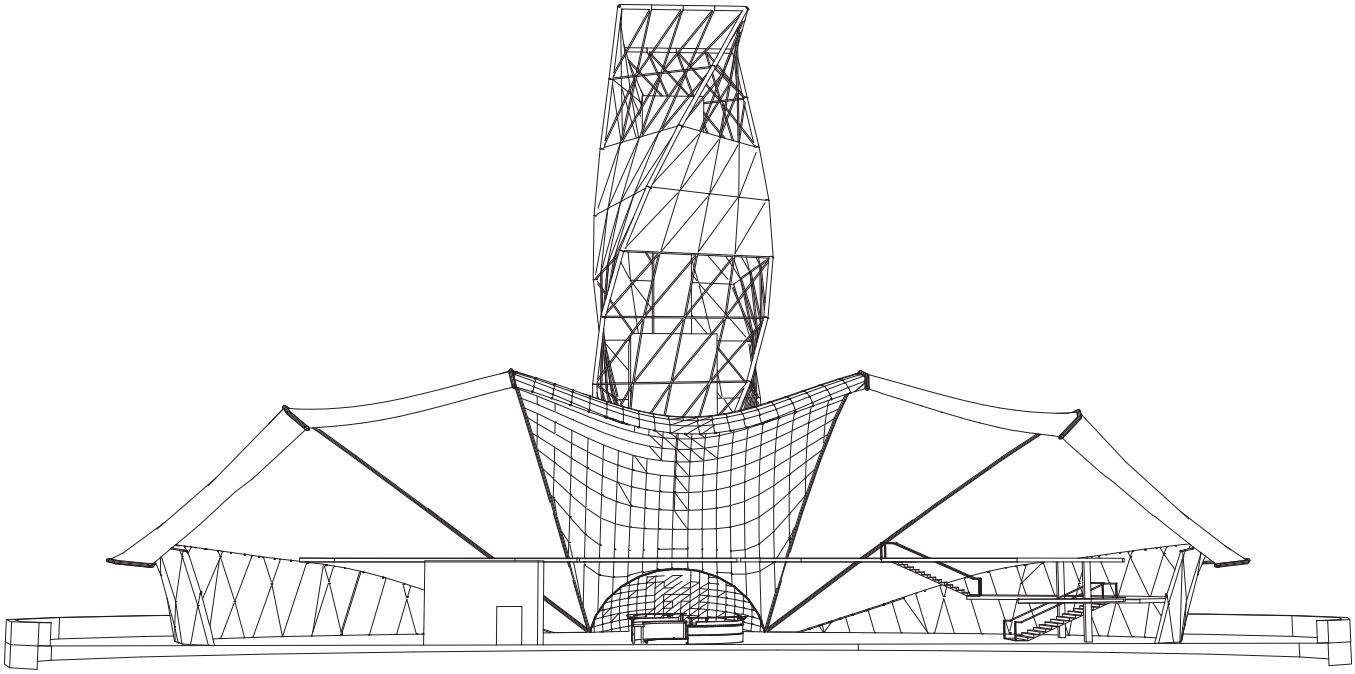


Fall Model



Spring Model

Spring Semester



Fall Model

Program:

-Welcome Desk

-auditorium

-restrooms

-gift shop

-dining area

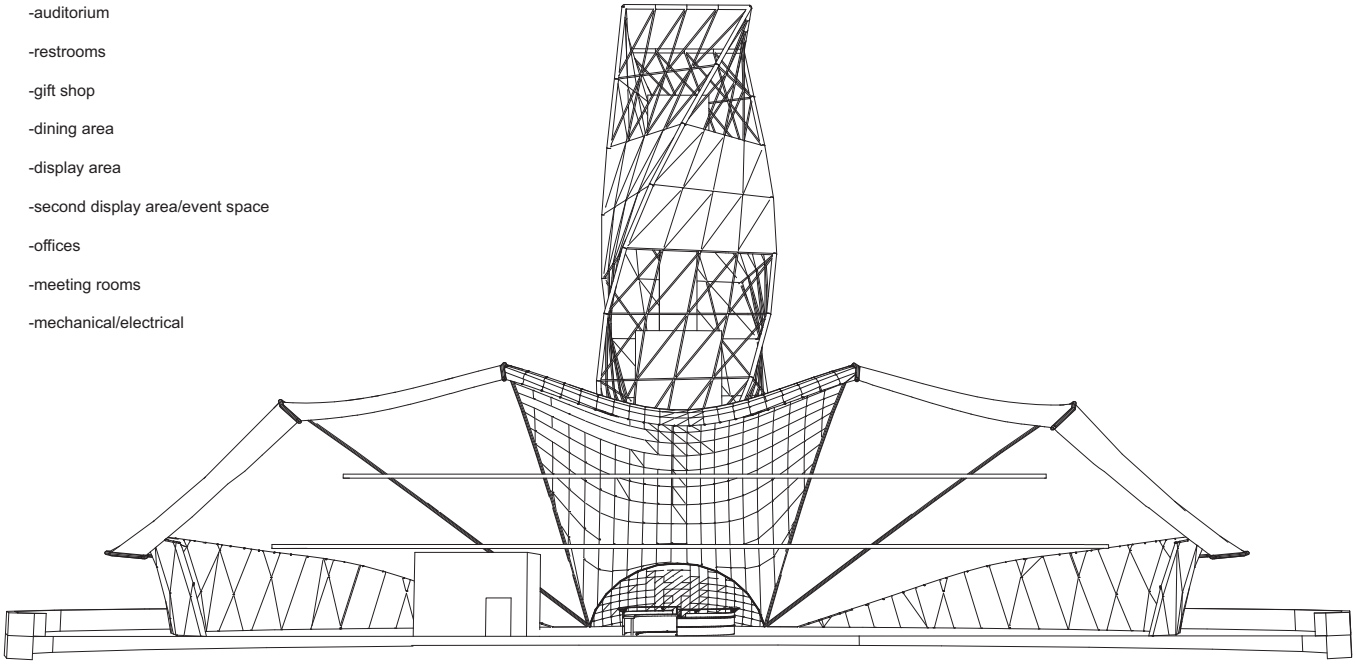
-display area

-second display area/event space

-offices

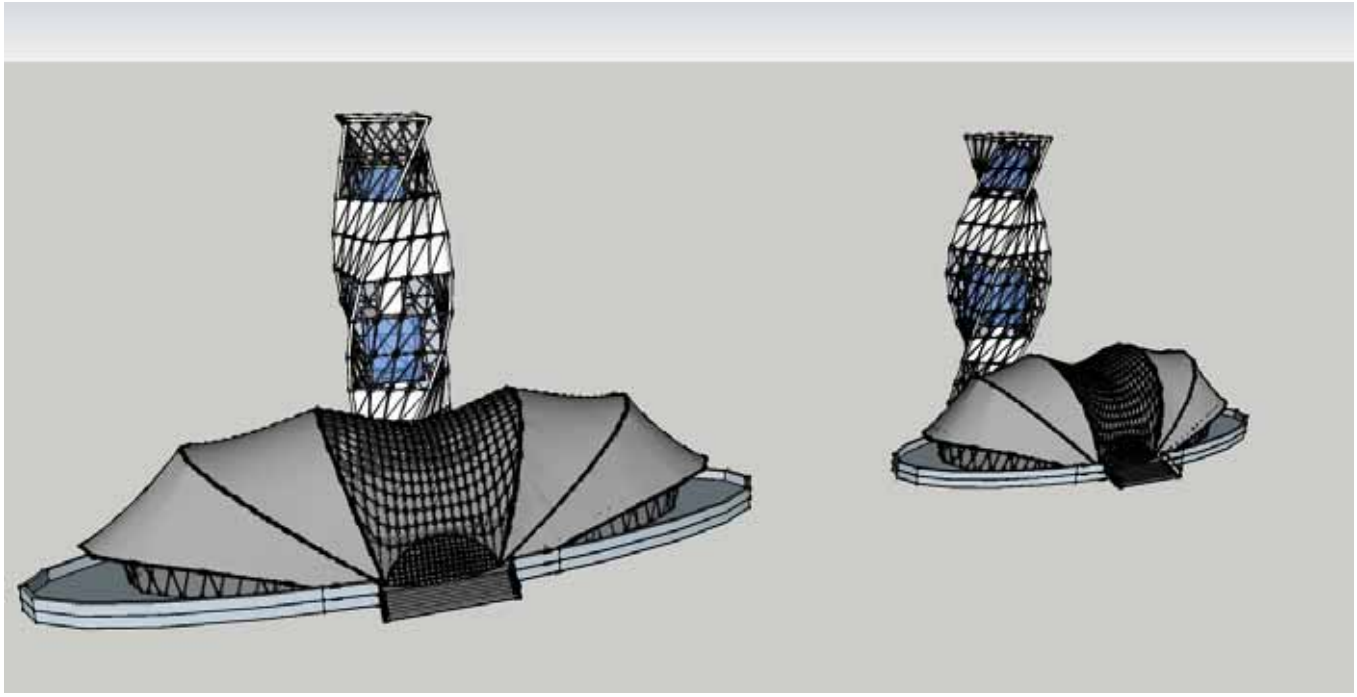
-meeting rooms

-mechanical/electrical



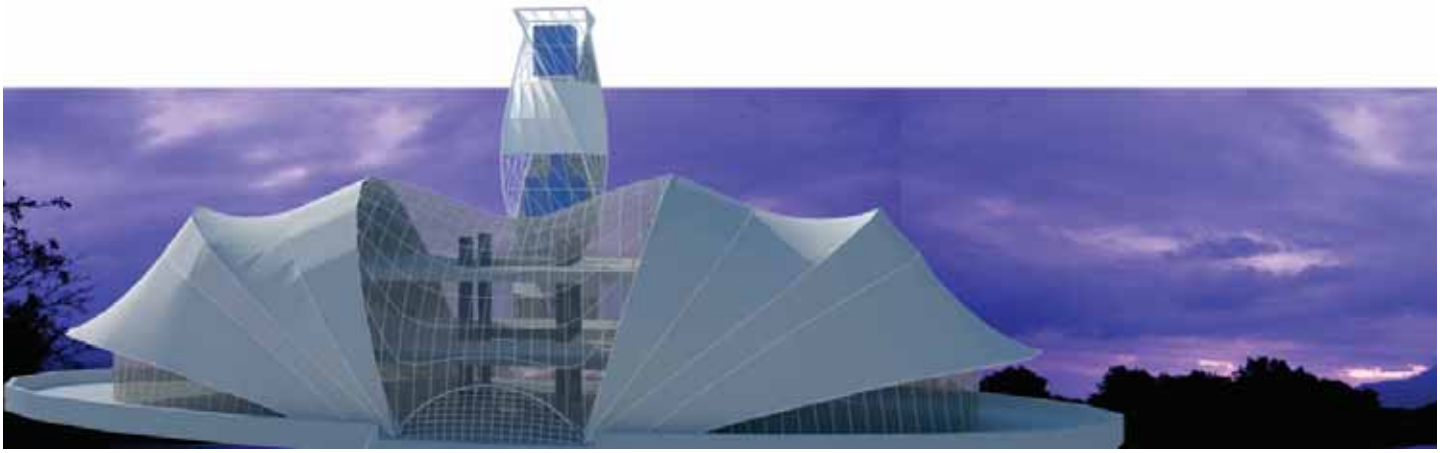
Spring Model

Spring Semester

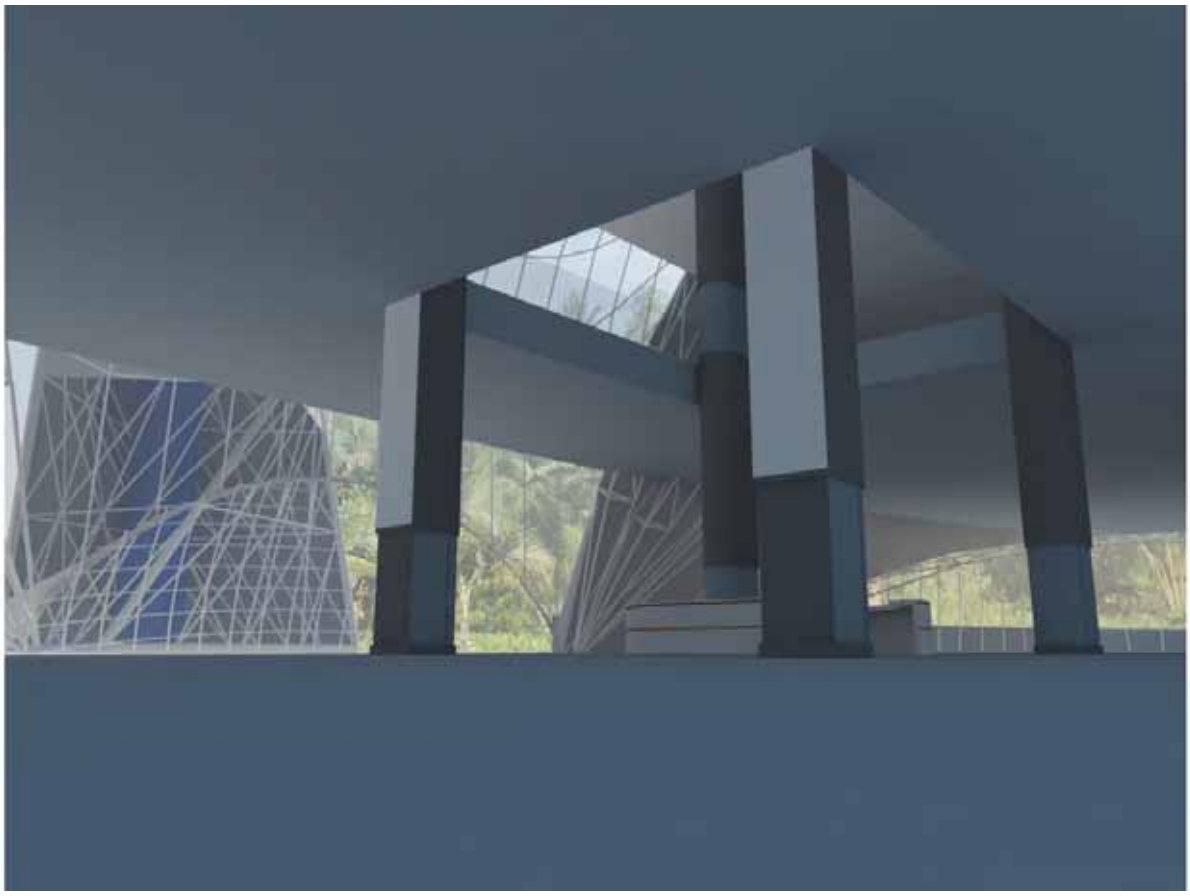


Sice By Side Comparison

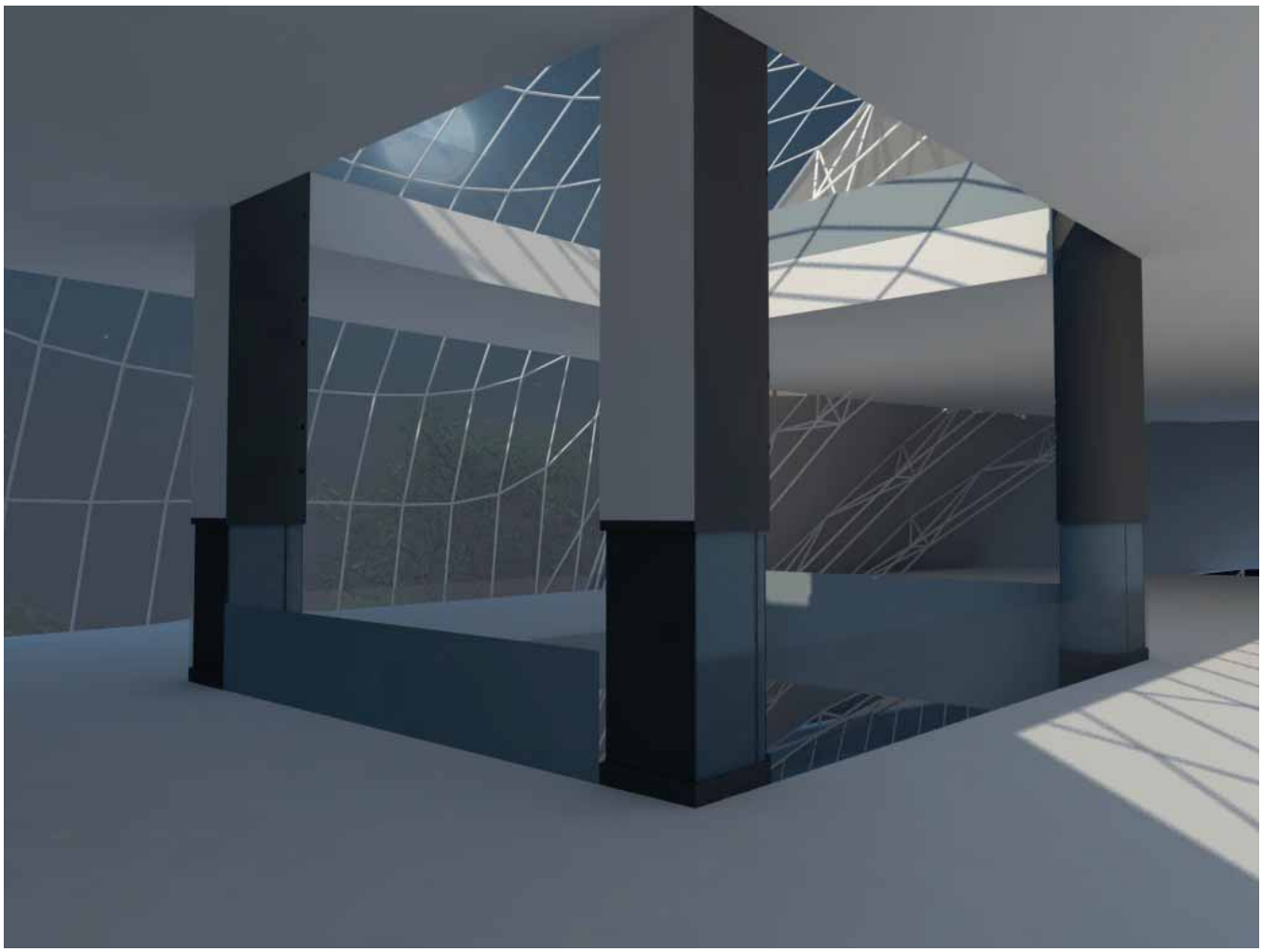
Spring Semester



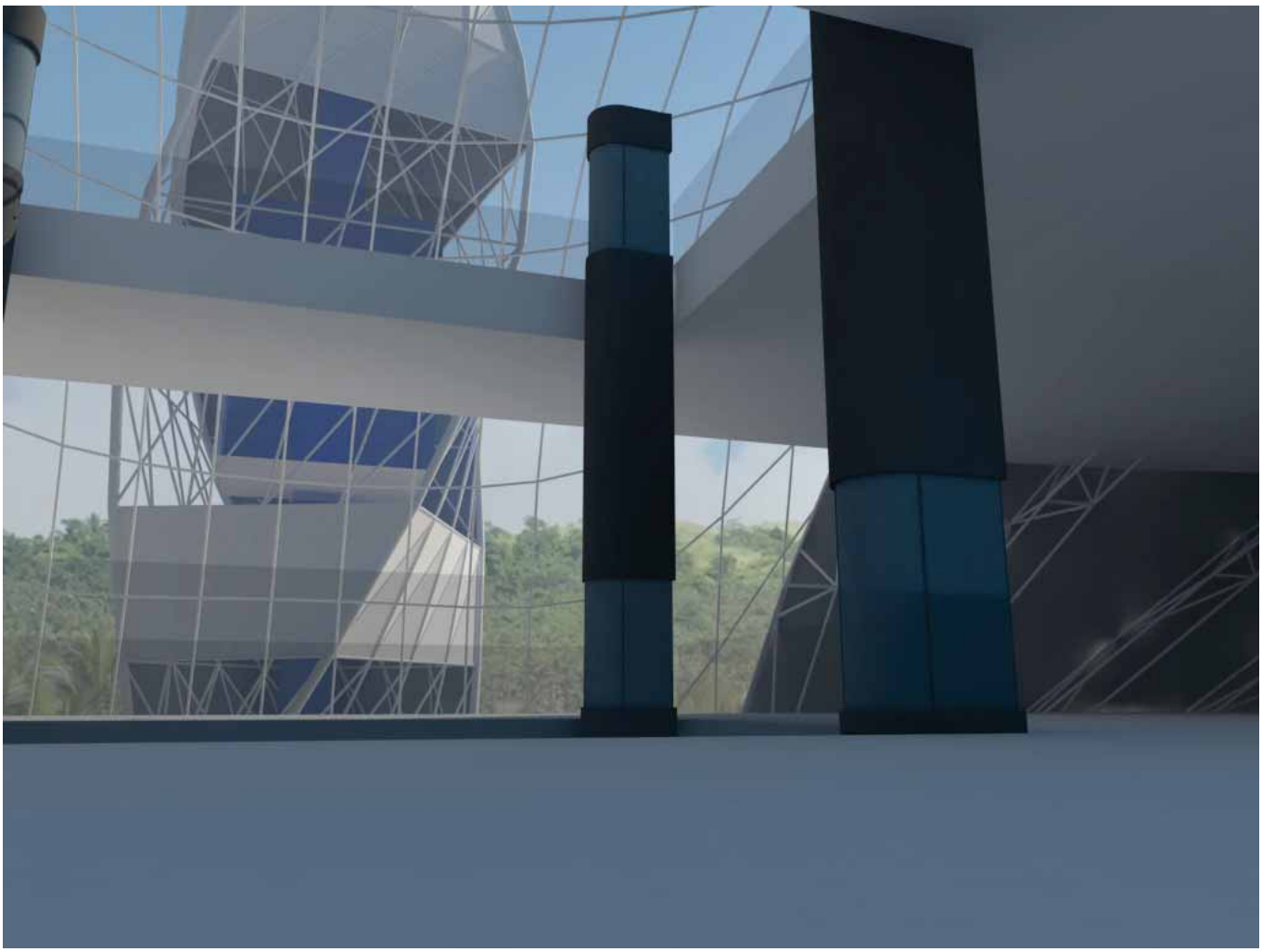
Spring Semester- Mid Review



Spring Semester- Mid Review



Spring Semester- Mid Review

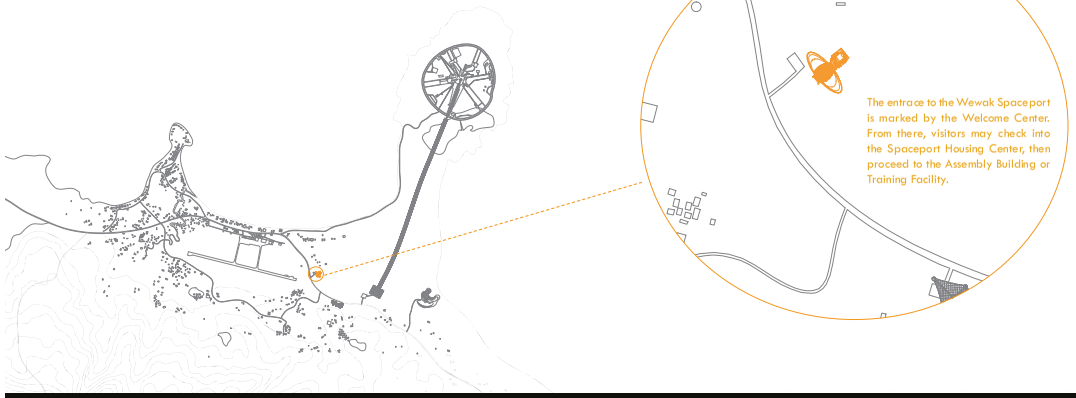


Spring Semester- Mid Review

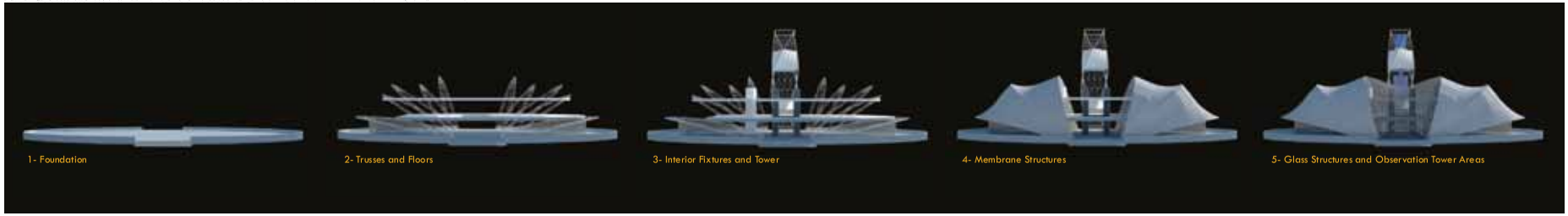
Spring Semester- Mid Review

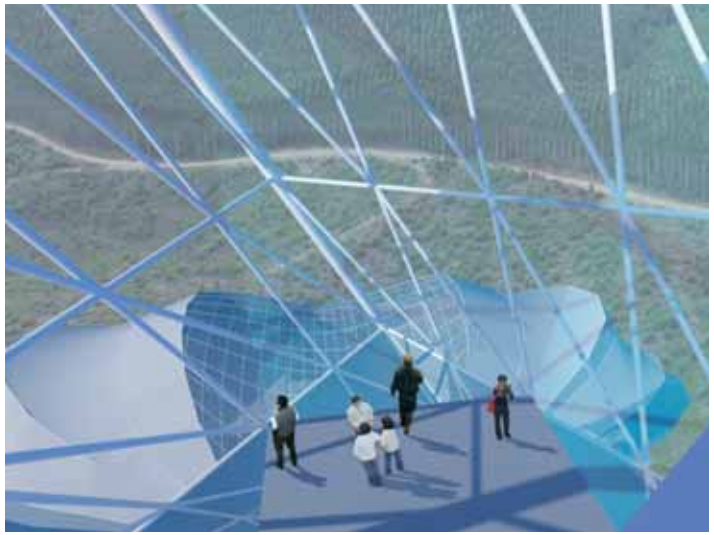
1 WEWAK SPACEPORT
welcome center
a steel/membrane structure

Located on the Cape Moem peninsula in Wewak, Papua New Guinea, the Spaceport Welcome Center serves as an information and check in site. It also showcases traveling and permanent exhibitions highlighting both spaceport history and New Guinea history and culture. Visitors may also witness shuttle launches in the Welcome Center or in the observation tower, just one level below mission control, against a beautiful tropical back drop.

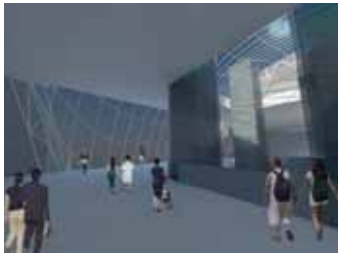



Atrium

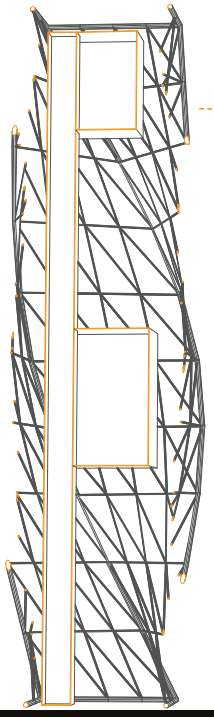


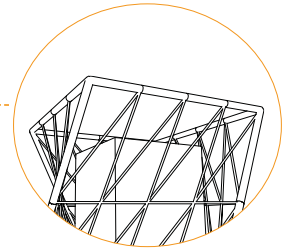


View From Observation Tower

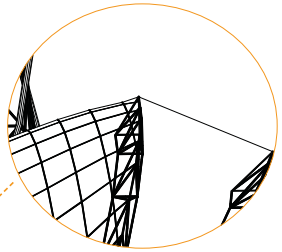


Second Floor

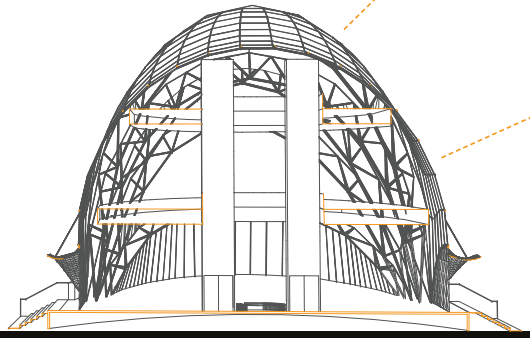


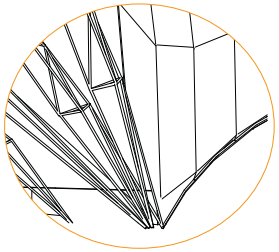


Observation Tower Detail



Roofing Detail





Truss Detail