Topic: QuickBird Satellites

Course: M.A. Geography (Semester - 3)

Paper – CC-11: Remote Sensing and GIS

By

Dr. Md. Nazim

Professor, Department of Geography

Patna College, Patna University

Lecture-6

Concept:

QuickBird *was a high-resolution commercial Earth observation satellite, owned by DigitalGlobe was launched on October 18, 2001from Vandenberg Air Force Base in California and was able to collect over 75million square kilometers of satellite imagery annually.On orbit for more than 13 years, the QuickBird mission ended on January27,2015. Howevever, the imagery from QuickBird is still available from Archive and DigitalGlobes robust constellations(WorlView -1,WorldView -2,WorldView -3 and GeoEye – 1) remains available for new satellite imagery.The satellite collected panchromatic (black and white) imagery at 61 centimeter resolution and multispectral imagery at 2.44- (at 450 km) to 1.63-meter (at 300 km) resolution, as orbit altitude is lowered during the end of mission life. At this resolution, detail of objects such as buildings and other infrastructure are easily visible. However, this resolution is insufficient for working with smaller objects such as a license plate on a car. The imagery can be imported into remote sensing image processing software, as well as into GIS packages for analysis.*

Contractors included Ball Aerospace and Technologies, Kodak and Fokker Space. Original plans called for a constellation of three QuickBird satellites scheduled to be in orbit by 2008. In the end, two QuickBird satellites, QuickBird I and II, made it to launch pad. However, only QuickBird II made it successfully into orbit (QuickBird I suffered launch failure). Thus QuickBird II satellite is usually referred to simply as QuickBird, and by the name QuickBird is usually meant the satellite QuickBird II.

****Prior to QuickBird I and II, DigitalGlobe launched the EarlyBird 1 successfully in 1997 but the satellite lost communications after only four days in orbit due to power system failure.***

QuickBird- I:

The first QuickBird, ***QuickBird I*** *(or* ***QuickBird 1****,* ***QB 1****, COSPAR 2000-074A) was launched 20 November 2000, by EarthWatch from the Plesetsk Cosmodrome in Russia by a Kosmos-3M rocket. QB-1 failed to reach planned orbit due to launch vehicle failure and was declared a failure. The satellite re-entered next day still attached to the upper stage of the rocket.The QB-1 satellite was in construction similar to QuickBird 2 satellite (described above and below in this article), which became later known simply as QuickBird.*

QuickBird – II:

***QuickBird II** (also **QuickBird-2** or **Quickbird 2**, **QB-2**, COSPAR 2001-047A) or as it was later known, simply **QuickBird**, was launched for DigitalGlobe October 18, 2001 from the Vandenberg Air Force Base, California, aboard a Boeing Delta II rocket.The satellite was initially expected to collect at 1 meter resolution but after a license was granted in 2000 by the U.S. Department of Commerce / NASA, DigitalGlobe was able to launch the QuickBird II with 0.61 meter panchromatic and 2.4 meter multispectral (previously planned 4 meter) resolution.*

Mission Extension:

In April 2011, the Quickbird satellite was raised from an orbit of 450 km (280 mi) to 482 km (300 mi).The process, started in March 2011, extended the satellite's life. Before the operation the useful life of Quickbird was expected to drop off around mid-2012 but after the successful mission, the new orbit prolonged the satellite life into early 2015.

Decaying:

The last picture was acquired on December 17, 2014. On January 27, 2015 QuickBird re-entered Earth's atmosphere.

Specifications:

Sensors:

- *60 cm (24 in) (1.37 µrad) panchromatic at nadir*
- *2.4 m (7 ft 10 in) (5.47 µrad) multispectral at nadir*
    - *MS Channels: blue (450–520 nm), green (520–600 nm), red (630–690 nm), near-IR (760–890 nm)[10]*

Swath width and area size:

- *Nominal swath width: 18 km at nadir*
- *Accessible ground swath: 544 km centered on the satellite ground track (to 30° off nadir)*
- Area of interest

- *Single area: 18 km by 18 km*
- *Strip: 18 km by 360 km*

Orbit:

- *Altitude (original): 450 km – 97.2 degree sun synchronous circular orbit[2]*
- *Altitude (post-orbit modification): 482 km – 98 degree sun synchronous inclination*
- *Revisit frequency: 1 to 3.5 days depending on latitude at 60 cm resolution[10]*

Viewing angle: Agile spacecraft, in-track and cross-track pointing[10]

- *Period 94.2 minutes*

On-board storage:

- *128 Gigabit capacity (approximately 57 single area images)*

Spacecraft:

- *Fueled for 7 years, design life 5 years*
- *2100 lb (950 kg), 3.04 m (10 ft) in length*

Launch:

- *Launch Date: October 18, 2001*
- *Launch Window: 1851–1906 GMT (1451–1506 EDT)*
- *Launch Vehicle: Delta II*
- *Launch Site: SLC-2W, Vandenberg Air Force Base, California*
- *USAF Designation: Quickbird 2.*

Mission Facts and Figures:

Operator	***DigitalGlobe***
Launch date	***18 October 2001***
End of Life	***January 27,2015***
Orbit Height	***450km***
Orbit Type	***Sun-synchronous, 10:30 am descending node***
Orbit Period	***93.4 minutes***
Revisit Time	***2.8 days at 1-metre GSD resolution 1.5 days at 1.5-metre GSD resolution These values are for targets at 20 degrees latitude.***
Swath Width	***16.5 km at nadir***
Sensor Bands	***Panchromatic: 450 - 900 nm*** ***4 Multispectral: Blue: 450 - 520 nm Green: 520 - 600 nm Red: 630 - 690 nm Near-IR: 760 - 900 nm***
Resolution	***Panchromatic:*** • ***60cm GSD at nadir*** ***Multispectral:*** • ***2.4m GSD at nadir***
Onboard sensors provided under TPM	***Ball Global Imagery System 2000 (BGIS2000)***

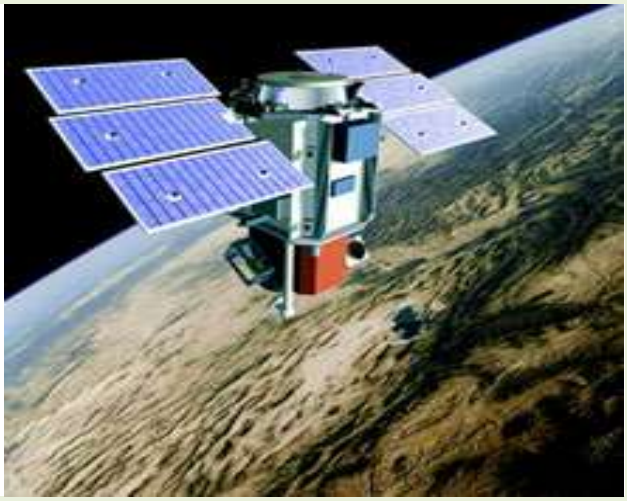
Platform	Lifetime (design)	Altitude	Equator Crossing	Repeat Coverage	Sensors
QuickBird-1 QuickBird-2	2001-present	450 km		1 - 3.5 days	QuickBird

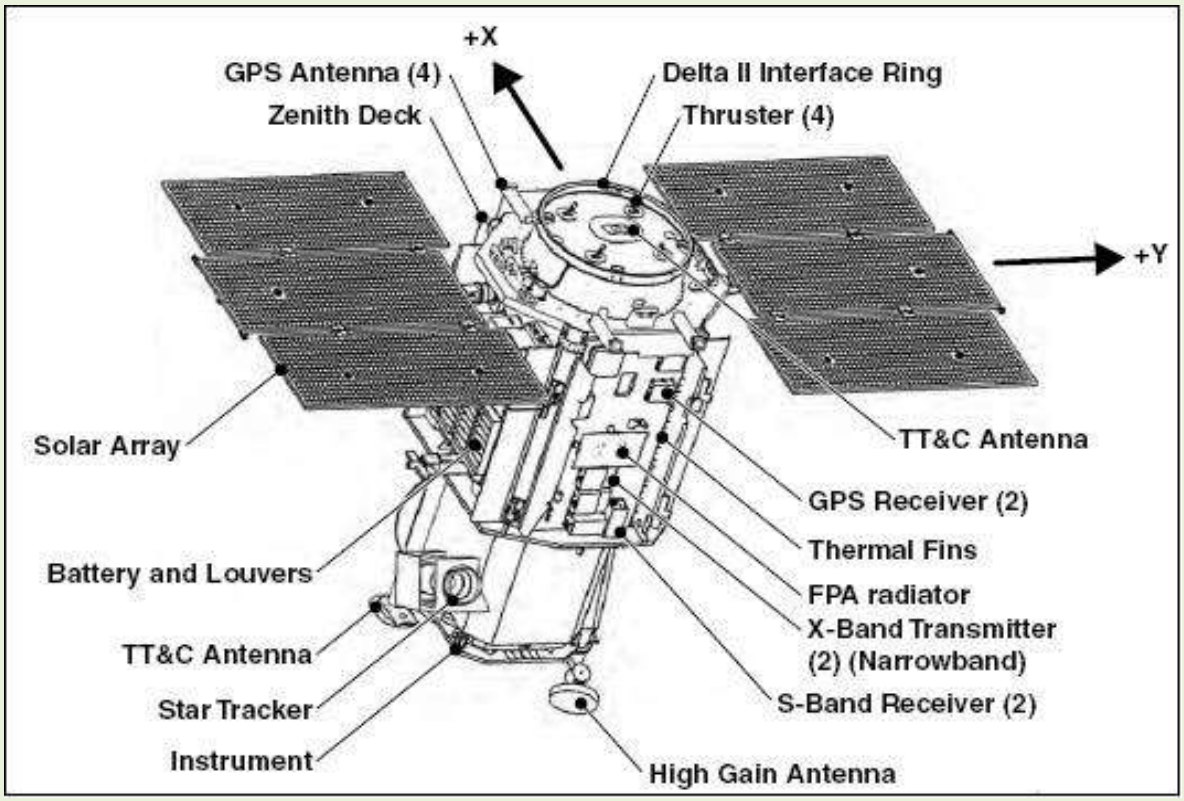
QuickBird Sensors

Sensor	Resolution (m)	Swath Width (km)	Sensor Channels	Spectral Bands (µm)	Example
QuickBird	0.61	13	PAN	0.445-0.900	

	2.44	*13*	*QuickBird 1 QuickBird 2 QuickBird 3 QuickBird 4*	*0.45-0.52 (blue) 0.52-0.60 (green) 0.63-0.69 (red) 0.76-0.90 (near IR)*	

Vatican City – Rome, Italy collected by the QuickBird satellite on August 24, 2004.




+X
GPS Antenna (4)
Zenith Deck
Delta II Interface Ring
Thruster (4)
+Y
Solar Array
TT&C Antenna
GPS Receiver (2)
Thermal Fins
FPA radiator
X-Band Transmitter
(2) (Narrowband)
S-Band Receiver (2)
Battery and Louvers
TT&C Antenna
Star Tracker
Instrument
High Gain Antenna

QuickBird- 2

Organization	*DigitalGlobe*
NSSDC ID	*2001-047A*
SATCAT	*26953*
Mission Type	*Earth observation*
Contractor	*Ball Aerospace & Technologies*[1]
Satellite of	*Earth*
Launch date	*October 18, 2001, 18:51 UTC*
Rocket	*Delta 7320-10 D288*
Launch site	*Vandenberg SLC-2W*
Design life	*5 years*[2]

Mission duration	***13 years and 2 months***
Launch mass	***1,100 kg (2,400 lb)***[2]
Dry mass	***951 kg (2,097 lb)***
Decay date	***January 27, 2015***
Webpage	***Official website***
	Orbital elements
Semi-major axis	***6,828 kilometers (4,243 mi)***
Perigee	***460 kilometers (290 mi)***
Apogee	***464 kilometers (288 mi)***
Inclination	***97.2 degrees***
Eccentricity	***0.00029***
Orbital period	***93.8 minutes***
	Instruments
Visible cameras	***61 cm panchromatic***
	2.4 meter multispectral

References:

1. ^ *Jump up to:[a] [b] Ball Aerospace: QuickBird*
2. ^ *Jump up to:[a] [b] [c] [d] [e] [f] [g] "QuickBird-2"*. **EOPortal.org.** ***Retrieved June 11, 2014.***
3. ^ *Digitalglobe: QuickBird Archived* ***May 17, 2008, at the*** *Wayback Machine*
4. ^ *[1]*
5. ^ *"DigitalGlobe Data Sheet: Quickbird" (PDF)*. **DigitalGlobe.com. DigitalGlobe. February 12, 2014.** ***Retrieved June 19, 2014.***
6. ^ *DigitalGlode History – QuickBird I Archived* ***September 23, 2009, at the*** *Wayback Machine*
7. ^ *https://nssdc.gsfc.nasa.gov/nmc/spacecraft/display.action?id=2000-074A*
8. ^ *Jump up to:[a] [b] https://space.skyrocket.de/doc_sdat/quickbird.htm*
9. ^ *"DigitalGlobe Completes Quickbird Satellite Orbit Raise"*. **DigitalGlobe News Room. April 18, 2011. Archived from** *the original* **on July 14, 2014.** ***Retrieved June 11, 2014.***
10. ^ *Jump up to:[a] [b] [c] "QuickBird 2 was successfully launched on 18 Oct 2001"*. **Center for Remote Imaging, Sensing & Processing. 2001.** ***Retrieved June 11, 2014.***
11. ^ **Mehuron, Tamar A., Assoc. Editor (August 2008).** *"2008 USAF Space Almanac – Major Civilian Satellites in Military Use" (PDF). Air Force Magazine*. **Vol. 91 no. 8. Pub: Air Force Association. pp. 49–50.**

External links:

- *DigitalGlobe – QuickBird specifications*