

**SATELLITE LAUNCHING
STATION KEEPING
SATELLITE STABILIZATION
TELEMETRY, COMMAND &
TRACKING SUBSYSTEM**

WHAT IS THE MECHANISM OF LAUNCHING OF SATELLITE?

- LAUNCH VEHICLE i.e LAUNCHER
- VELOCITY VECTOR & ORBITAL HEIGHT
- ORBIT HEIGHT – 42164.17 KM
- ABOVE FROM SURFACE OF EARTH 35786 KM
- SPACE SHUTTLE – WHICH IS ALSO SPACE TRANSPORTATIONS SYSTEM (STS) BY NASSA
- ALSO CALLED EXPENDABLE LAUNCH VEHICLE (ELV)
- REUSABLE LAUNCH VEHICLE (RLV)

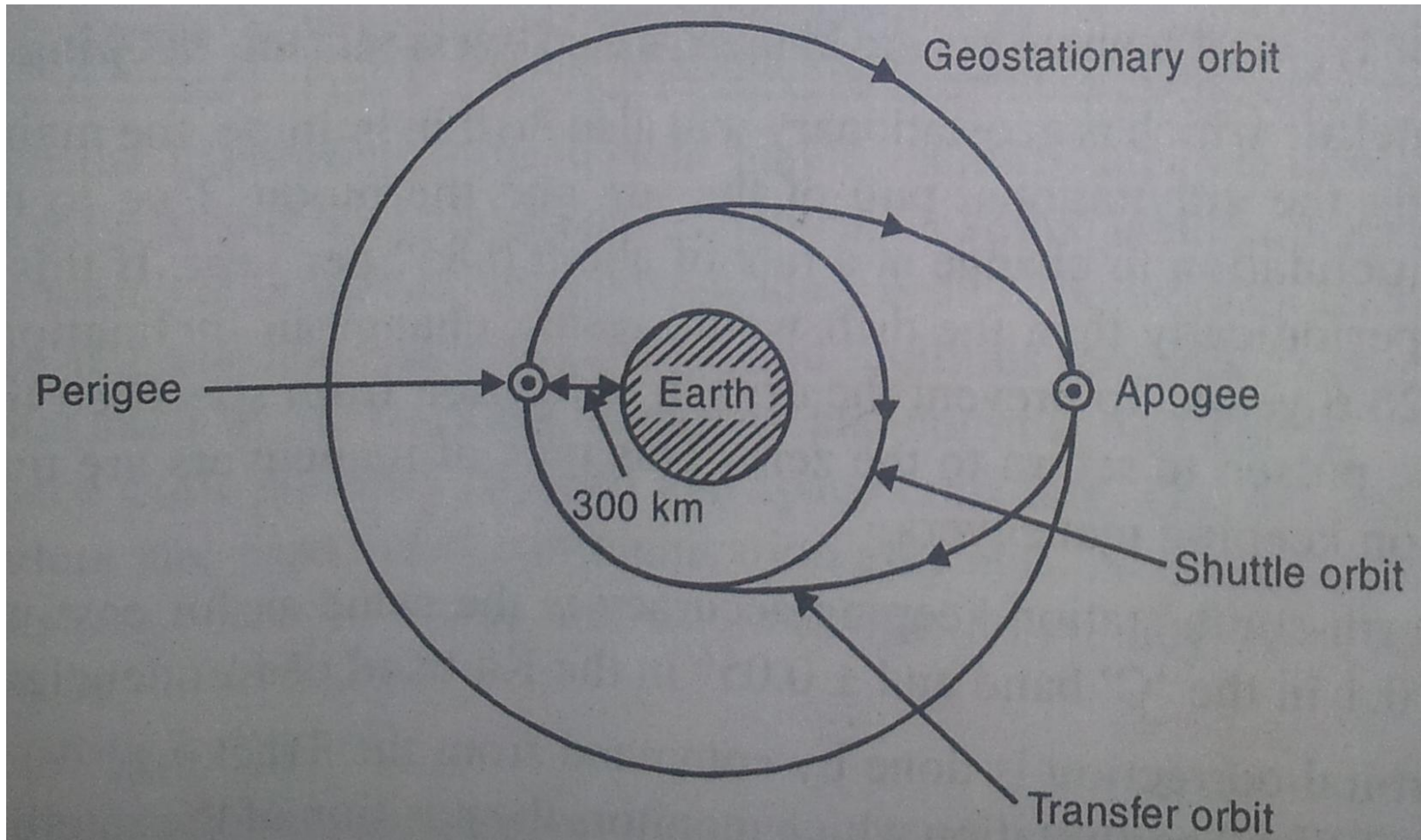
SPACE SHUTTLE

- LAUNCHED IN CIRCULAR ORBIT
- INITIALLY LAUNCH IN LOW ORBIT
- APPROX 300 KM ABOVE EARTH SURFACE
- LATER IN ELLIPTICAL ORBIT
- GEOTRANSFER ORBIT
- HIGHEST POINT IS CALLED APOGEE
- LOWEST POINT IS CALLED PERIGEE
- TRANSFER ORBIT WHICH MINIMIZE THE ENERGY COSTS IS CALLED **HOHMANN TRANSFER ORBIT**

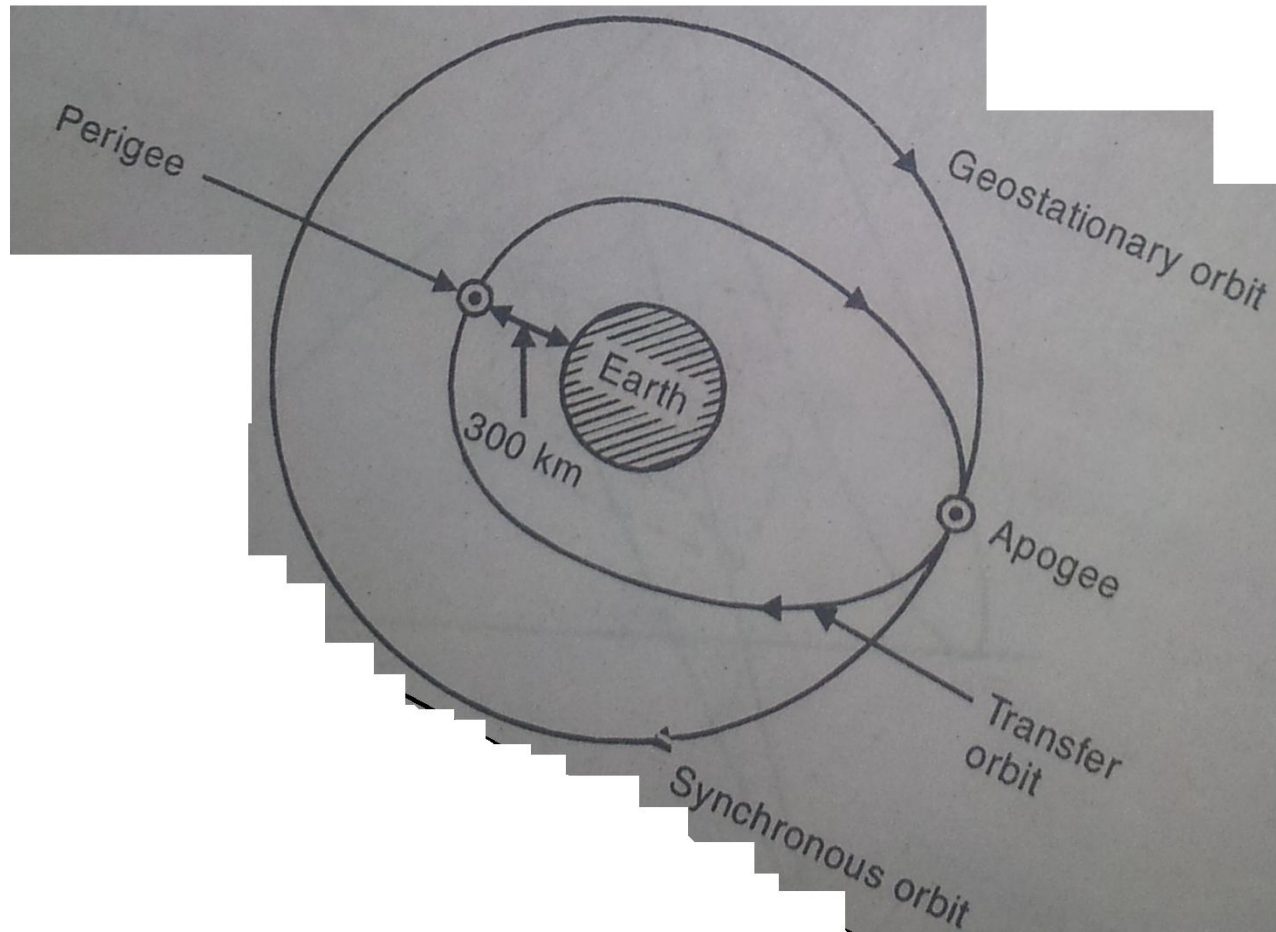
LAUNCHING STEPS

- LAUNCHING SATELLITE WITH SPACE SHUTTLE IS LESS EXPENSIVE
- SPACE SHUTTLE CAN BE REUSED
- FIRST LAUNCHED CLOSE TO THE EQUATOR
- BY THIS FUEL COST IS REDUCED
- BY THIS LAUNCHI

Launching steps using SPACE SHUTTLE



Launching steps using EXPANDABLE LAUNCHER



Continue

- AN UN MANNED LAUNCH VEHICLE
- USED TO PLACE DIRECTLY IN AN ELLIPTICAL ORBIT
- ELLIPTICAL ORBIT IS TANGENT TO THE GEOSTATIONARY ORBIT AT ITS APOGEE.
- SATELLITE FIRES ITS THRUSTER ROCKET AT THE APOGEE WHICH PROVIDES ACCELERATION NEEDED TO TRANSFER THE SATELLITE FROM AN ELLIPTICAL ORBIT IN TO A GEOSTATIONARY ORBIT.

STATION KEEPING

- SATELLITE BE KEPT IN ITS CORRECT ORBIT PATH ALONG ITS ALLTITUDE.
- EQUATORIAL ELLIPTICITY OF EACH CAUSES DRIFTING OF GOSTATIONARY SATELLITE FROM 75° TO 105°
- FOR THIS AN OPPOSITELY DIRECTED VELOCITY COMPONENT IS IMPORTED TO THE SATELLITE BY MEANS OF JETS
- THESE ARE PULSED ONCE IN EVERY 2-3 MONTHS

CONTINUE

- THIS RESULTS BACK THROUGH ITS NORMAL STATION POSITION AND COME TO STOP.
- SAME PROCESS REPEATS AFTER 2-3 WEEKS
- THIS KIND OF MANEUVERS ARE KNOWN AS EAST WEST STATION KEEPING.
- SOME ARE BECAUSE OF GRAVITATIONAL PULL OF THE SUN AND MOON
- CHANGE AT A RATE OF ABOUT 85° PER YEAR.

CONTINUES

- THE ORBITAL CORRECTION IS DONE BY COMMAND FROM THE TRACKING, TELEMETRY AND COMMAND EARTH STATION
- THIS MONITORS THE POSITION OF THE SATELLITE.
- ALL E-W AND N-S STATION KEEPING MAUNVERS ARE CARRIED OUT USING SAME THRUSTERS AS USED FOR ALTITUDE CONTROL.

SATELLITE STABILISATION

- SATELLITE SYSTEM

- A) GROUND SEGMENT

- B) SPACE SEGMENT

- SPACE CRAFTS LAUNCH SATELLITE IN GEOSTATIONARY ORBIT TO BECOME AN ARTIFICIAL SATELLITE

- NOW SPACE SEGMENTS INCLUDES GROUND FACILITIES REQUIRE TO KEEP SATELLITE OPERATIONAL

CONTINUE

- TRACKING
- TELEMETRY
- COMMAND
- IN COMBINED THEY ARE KNOWN AS TT&C SERVICES.