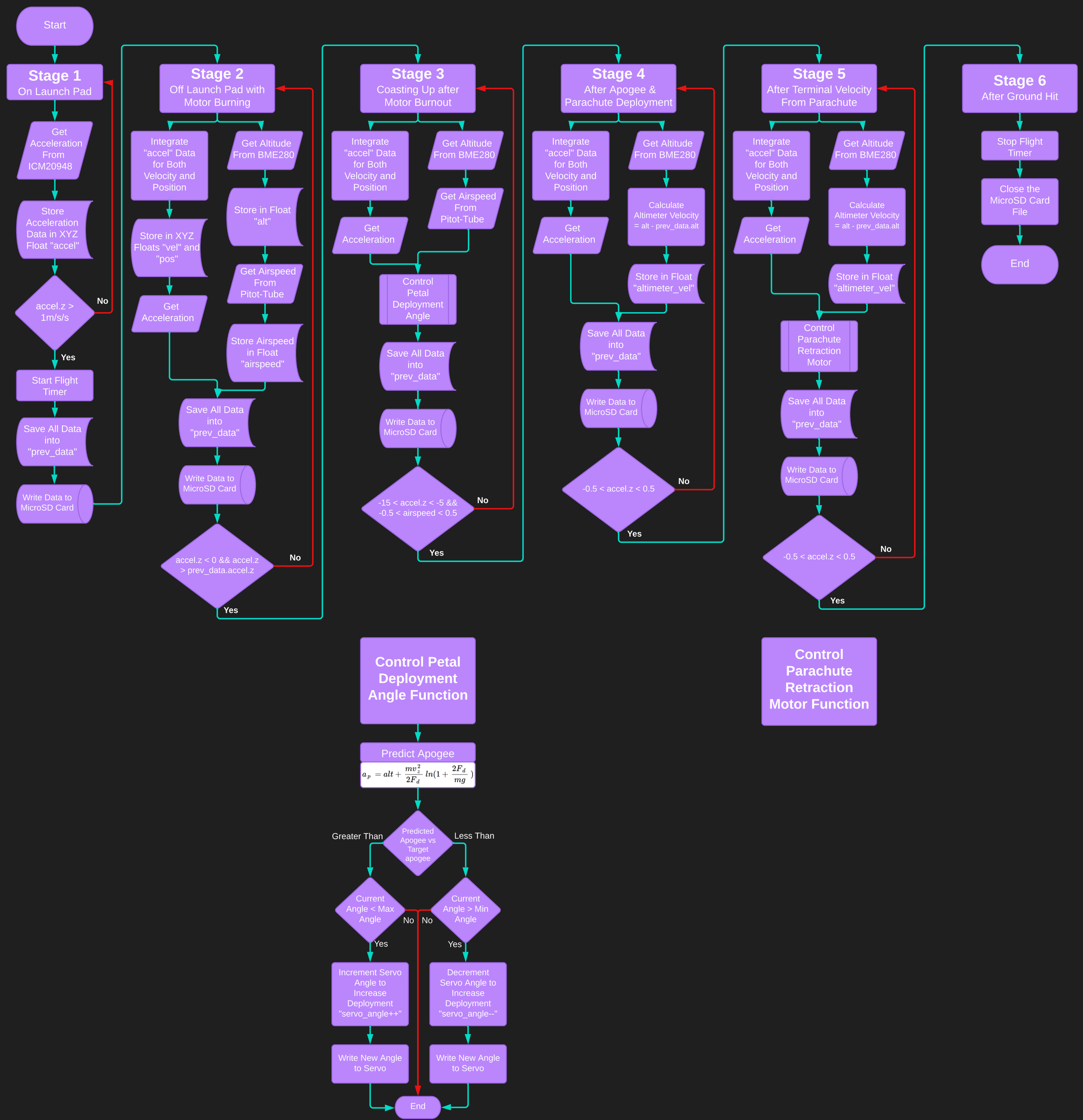
Start
Stage 1
On Launch Pad
Get Acceleration From ICM20948
Store Acceleration Data in XYZ Float "accel"
accel.z > 1m/s/s
No
Yes
Start Flight Timer
Save All Data into "prev_data"
Write Data to MicroSD Card
Stage 2
Off Launch Pad with Motor Burning
Integrate "accel" Data for Both Velocity and Position
Store in XYZ Floats "vel" and "pos"
Get Acceleration
Get Altitude From BME280
Store in Float "alt"
Get Airspeed From Pitot-Tube
Store Airspeed in Float "airspeed"
Save All Data into "prev_data"
Write Data to MicroSD Card
accel.z < 0 && accel.z > prev_data.accel.z
No
Yes
Stage 3
Coasting Up after Motor Burnout
Integrate "accel" Data for Both Velocity and Position
Get Acceleration
Get Altitude From BME280
Get Airspeed From Pitot-Tube
Control Petal Deployment Angle
Save All Data into "prev_data"
Write Data to MicroSD Card
-15 < accel.z < -5 && -0.5 < airspeed < 0.5
No
Yes
Stage 4
After Apogee & Parachute Deployment
Integrate "accel" Data for Both Velocity and Position
Get Acceleration
Get Altitude From BME280
Calculate Altimeter Velocity = alt - prev_data.alt
Store in Float "altimeter_vel"
Save All Data into "prev_data"
Write Data to MicroSD Card
-0.5 < accel.z < 0.5
No
Yes
Stage 5
After Terminal Velocity From Parachute
Integrate "accel" Data for Both Velocity and Position
Get Acceleration
Get Altitude From BME280
Calculate Altimeter Velocity = alt - prev_data.alt
Store in Float "altimeter_vel"
Control Parachute Retraction Motor
Save All Data into "prev_data"
Write Data to MicroSD Card
-0.5 < accel.z < 0.5
No
Yes
Stage 6
After Ground Hit
Stop Flight Timer
Close the MicroSD Card File
End
Control Petal Deployment Angle Function
Predict Apogee
$a_p = alt + \frac{mv_z^2}{2F_d} ln(1 + \frac{2F_d}{mg})$
Predicted Apogee vs Target apogee
Greater Than
Less Than
Current Angle < Max Angle
Current Angle > Min Angle
No
No
Yes
Yes
Increment Servo Angle to Increase Deployment "servo_angle++"
Decrement Servo Angle to Increase Deployment "servo_angle--"
Write New Angle to Servo
Write New Angle to Servo
End
Control Parachute Retraction Motor Function