Autopilot assignment (Due by Friday, 19th April at 11 am)

Create a minimized FSM for the following problem.

Function	Value range	Constraints	Remarks
Throttle	0-1000 (final speed) Throttle level min-max, idle, 0, 1-5.	Increments of 10.	
Reverse thrust	Min-max, 4		
Flaps	0-full, 6		
Climb	5	Cannot do with descend	
Descend	8	Cannot do with climb or above 1000 ft (1)	
Gear down	0-1	Cannot do at cruise	
Cruise	Speed 500-1000 Altitude given	Cannot do while climb, land, descend	
Turn left	0-30	Cannot do while turning right/land/takeoff	
Turn right	0-30	Cannot do while turning left/land/takeoff	
Bearing	0-360		
Altitude	0-400	Increments of 10	
Cruise	300-1000	Increments of 50, but one fixed value	
Land			
V1	150		Min speed before which a take off can be avoided
V2-Take off	300		Speed for take off.
TCAS warning	Climb to X or Descend to Y	Warning. Ensures one plane ascends, another descends. There is no possibility if 3 planes are colliding. Then TCAS is between every plane-pair.	
Stall warning	Drop nose and increase throttle to Z	(elevator down, followed by throttle speed Z) No flaps, Landing gear up.	
Turbulence	Altitude 0-400 Speed 300-800	You must avoid that altitude by going up or down You must reduce your speed to the turbulence penetrating speed.	
On land: left turn, right turn	Speed 0-100		

The autopilot is fed a series of instructions at high level.

The goal is to automatically take-off, avoid turbulence, avoid collision and land at the destined airport

To take off, move your plane using nose wheel and throttle to the edge of the run way. Speed <200.
Then put flaps to 100%
When given clear to take off, then line up your plane and max throttle. At V2, deploy elevators.
After take-off, retract nose wheel. Reduce flaps
Continue to reduce flaps till 0 at 3000 feet.
Then climb. Avoid turbulence. Whenever there is turbulence, there will be a turbulence penetration speed and altitude. Make changes accordingly.

Make your plane level to 39000 feet.
Select correct bearing. Change course as required.
When you reach the destination rendezvous point: you begin to descend.
To land, decrease throttle to 400, and descend to 10000 ft.
Thereafter add flaps and descend to 3000
Then, deploy full flaps.
Align with the runway.
Gear down at 1500 feet.
Reduce speed to 300
Land.

<u>An example to check your FSM</u>

- Taxi 500 meters @ 200
- Take right
- Taxi 200 meters @ 200, full flaps
- Wait for clearance
- On clearance go to V1, V2, and take off at 300 kmph
- At 3000 ft, reduce flaps to 50%
- At 5000, reduce flaps to 20%
- At 1000 zero flaps.
- Change course to 020 and climb to 25000 speed 700
- Change course to 125 and climb to 34000 speed 750
- Change course to 135 and cruise till rendezvous point alpha (x1, y1) maintain speed 900
- Change course to 140 and cruise till rendezvous point beta (x2, y2) and maintain speed 900
- Initiate landing
- Descend to rendezvous point gamma (x3,y3) at altitude 15000
- Change course 020 and descend to 10000
- Drop flaps 20%, reduce speed to 400
- Drop flaps 50%, reduce speed to 300, altitude 5000
- Change course 080 keep descending
- Flaps 100%, altitude 3000 speed 200
- Final approach, landing gear down
  Continue course 080, descend, land.
  Apply thrust reversers full. Brake