

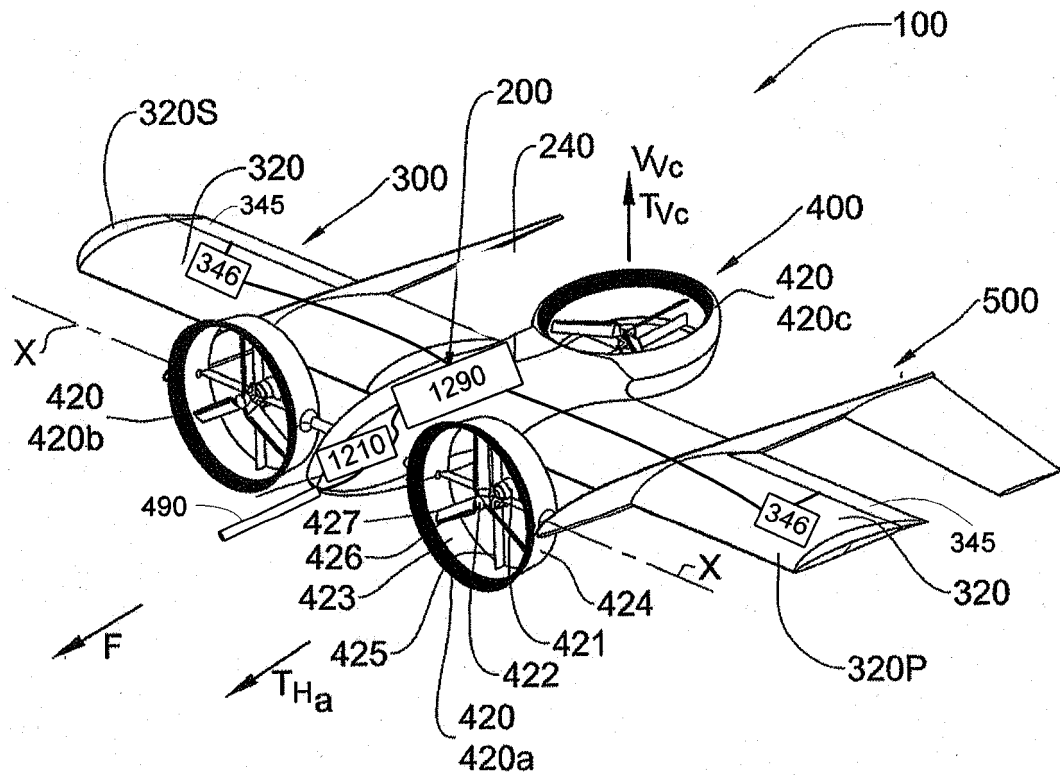


Fig. 1A

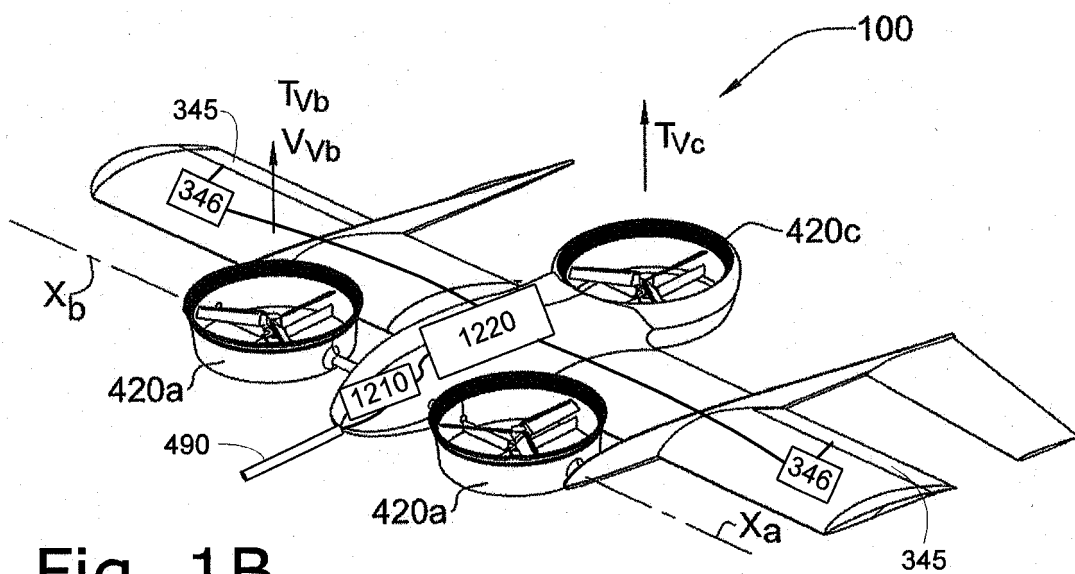


Fig. 1B

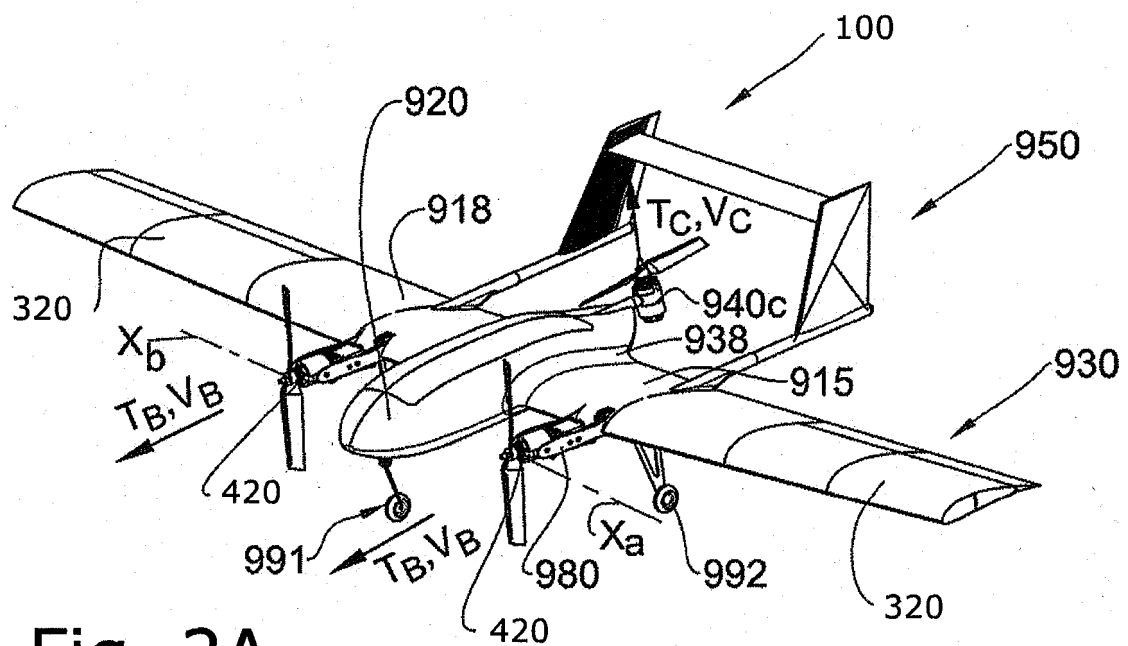


Fig. 2A

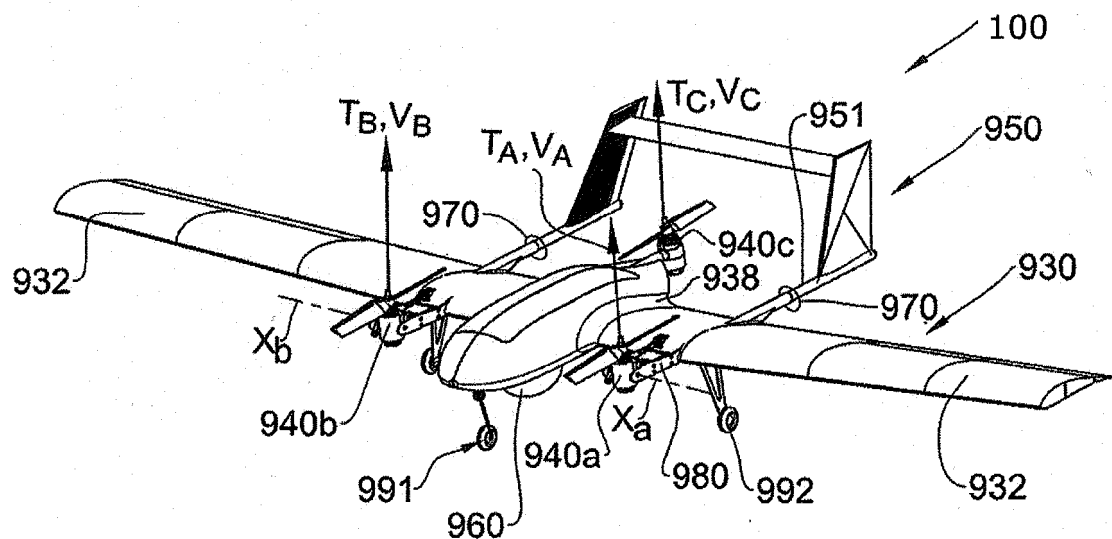
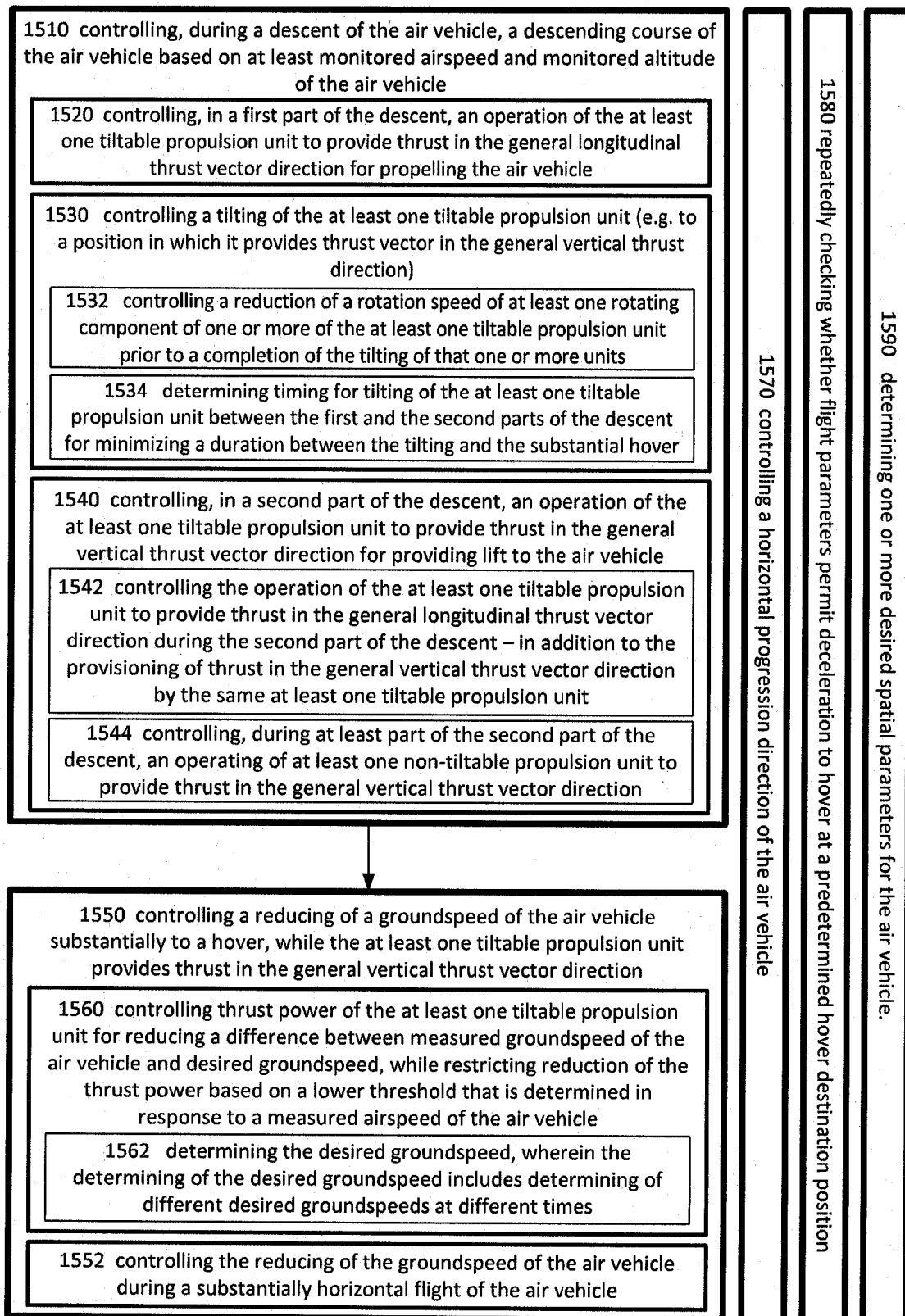


Fig. 2B



1500

Fig. 3A

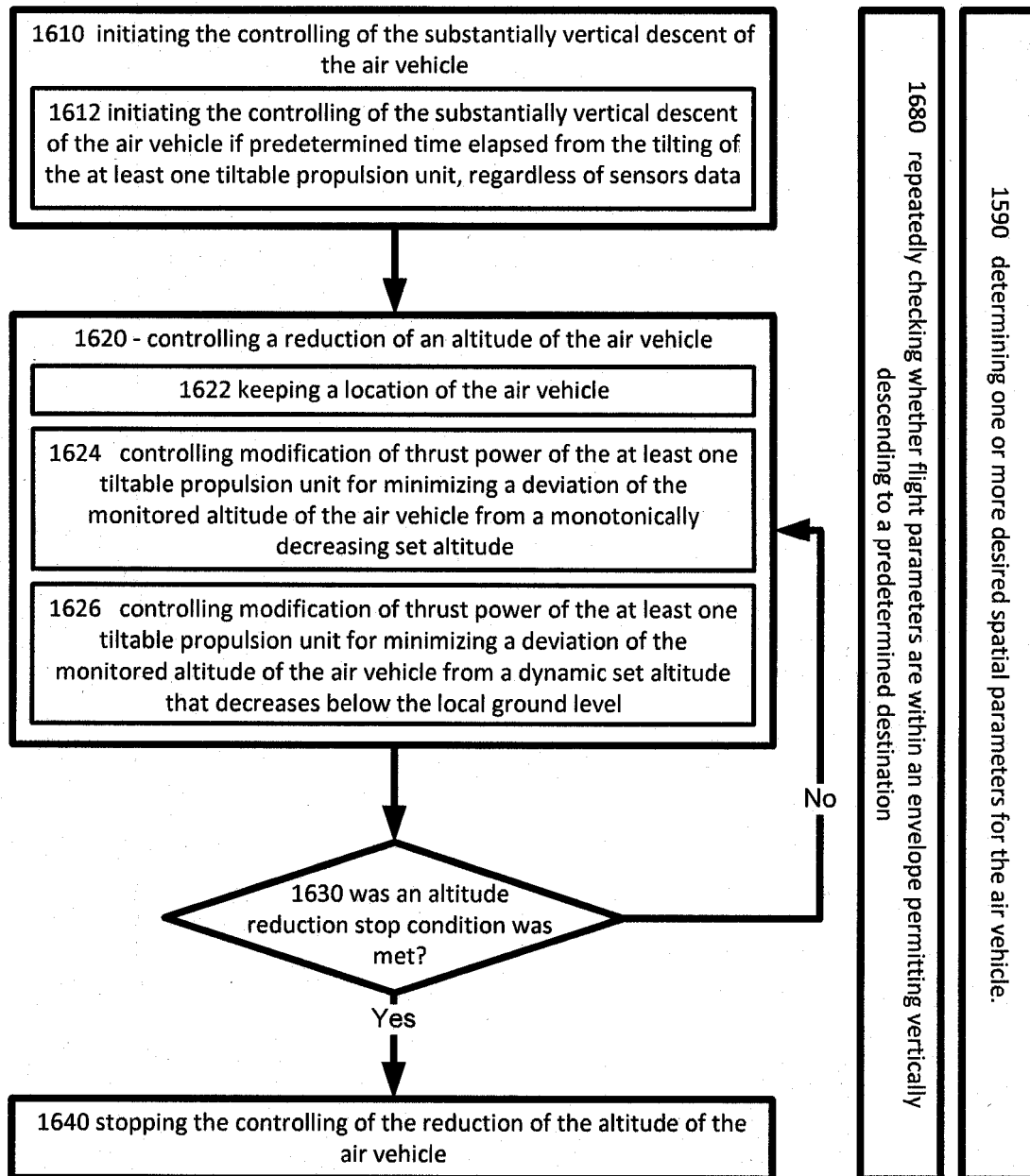
1600

Fig. 3B

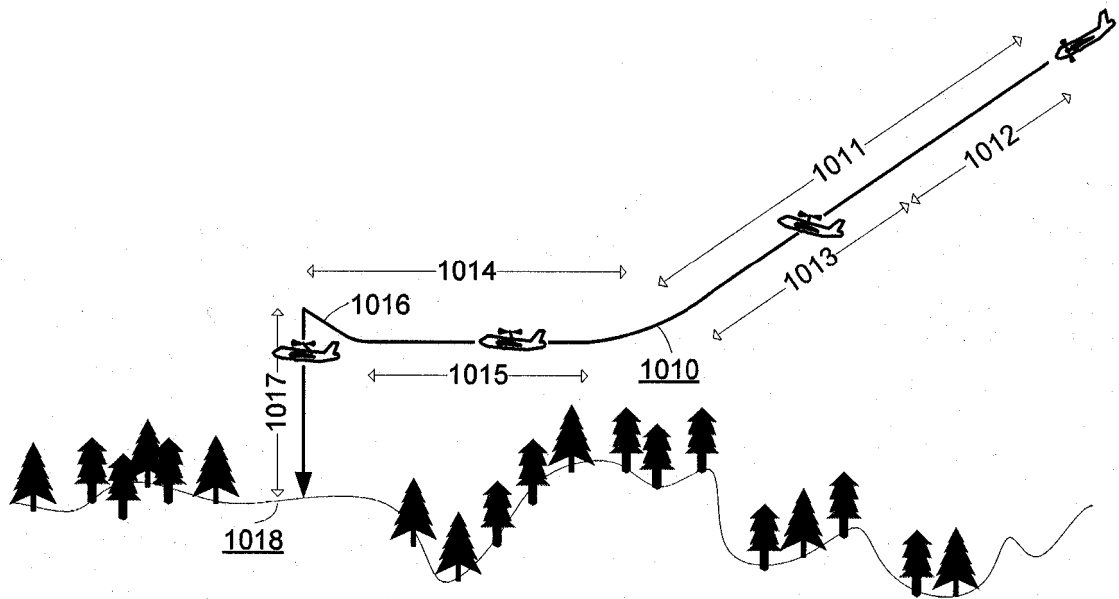


Fig. 4A

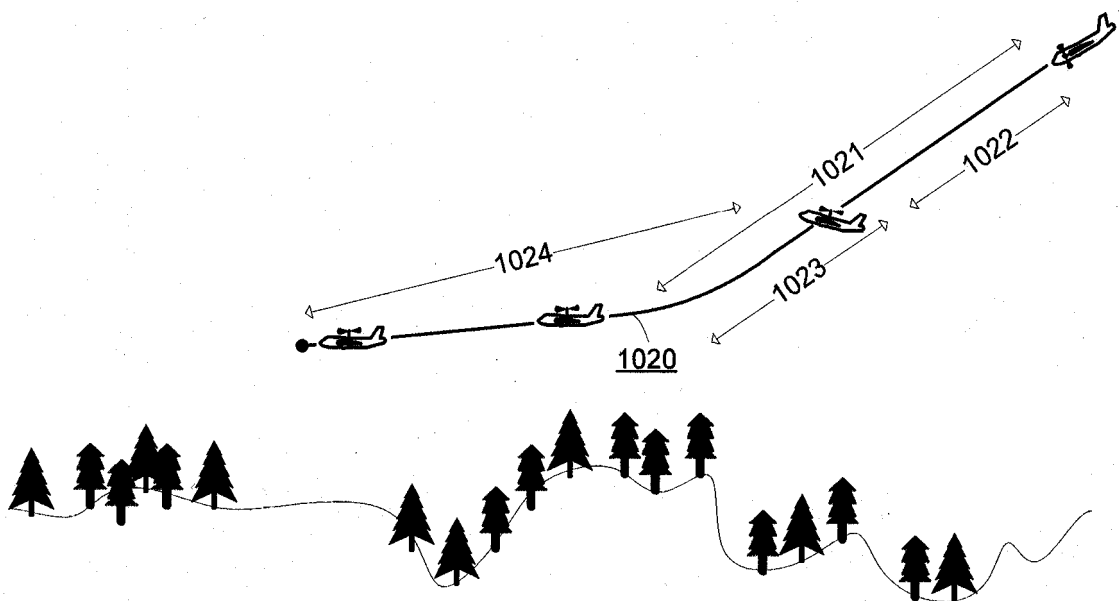
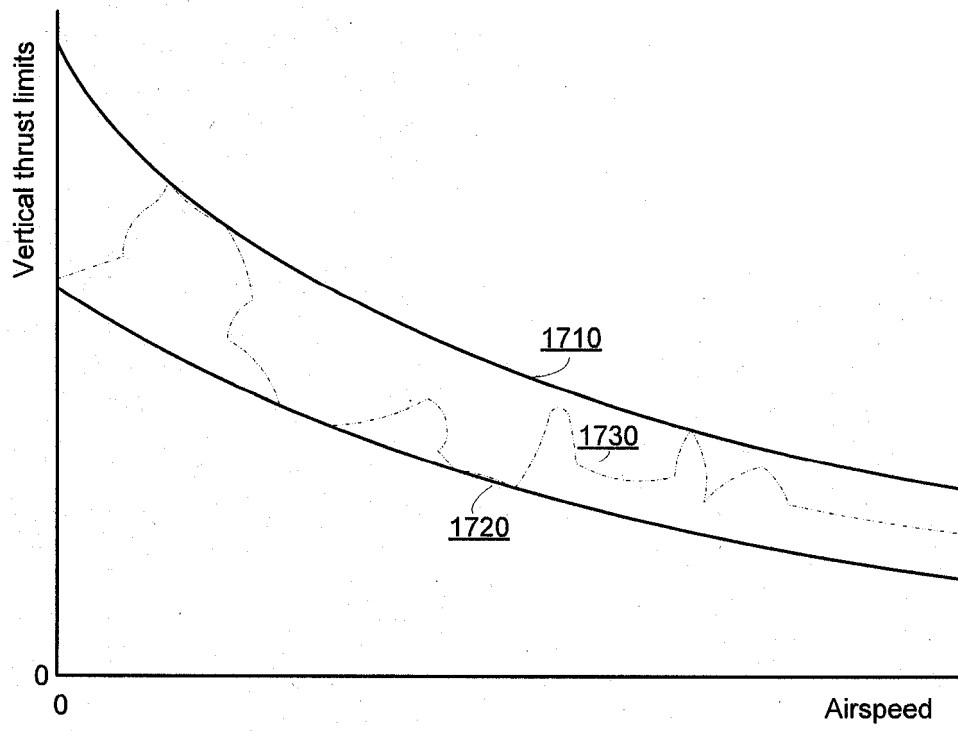
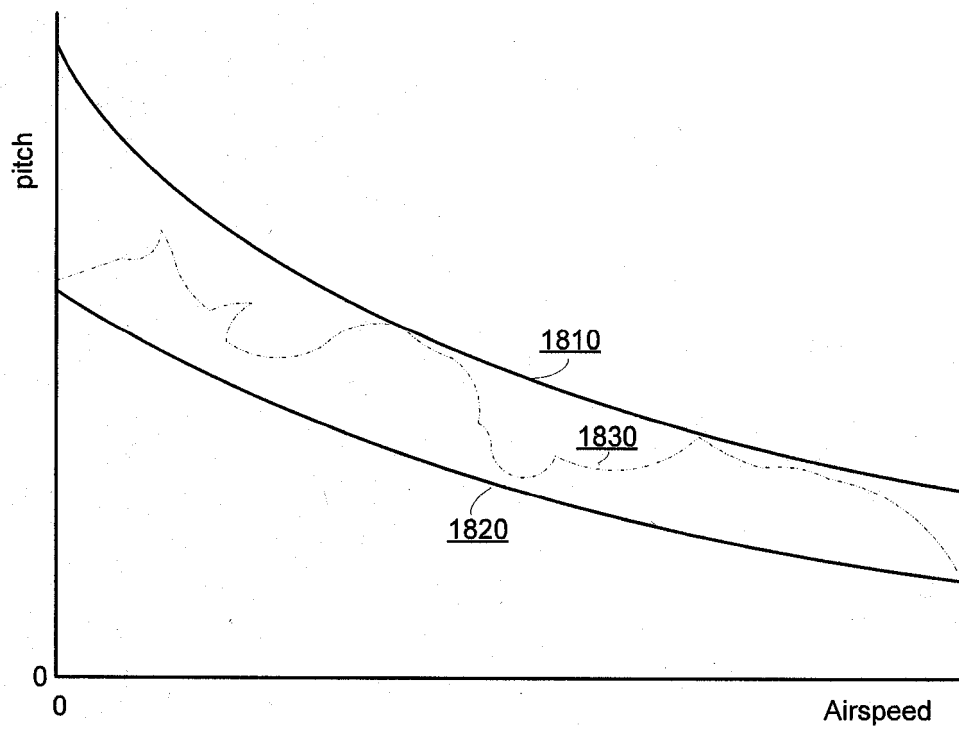


Fig. 4B

**Fig. 5**

**Fig. 6**

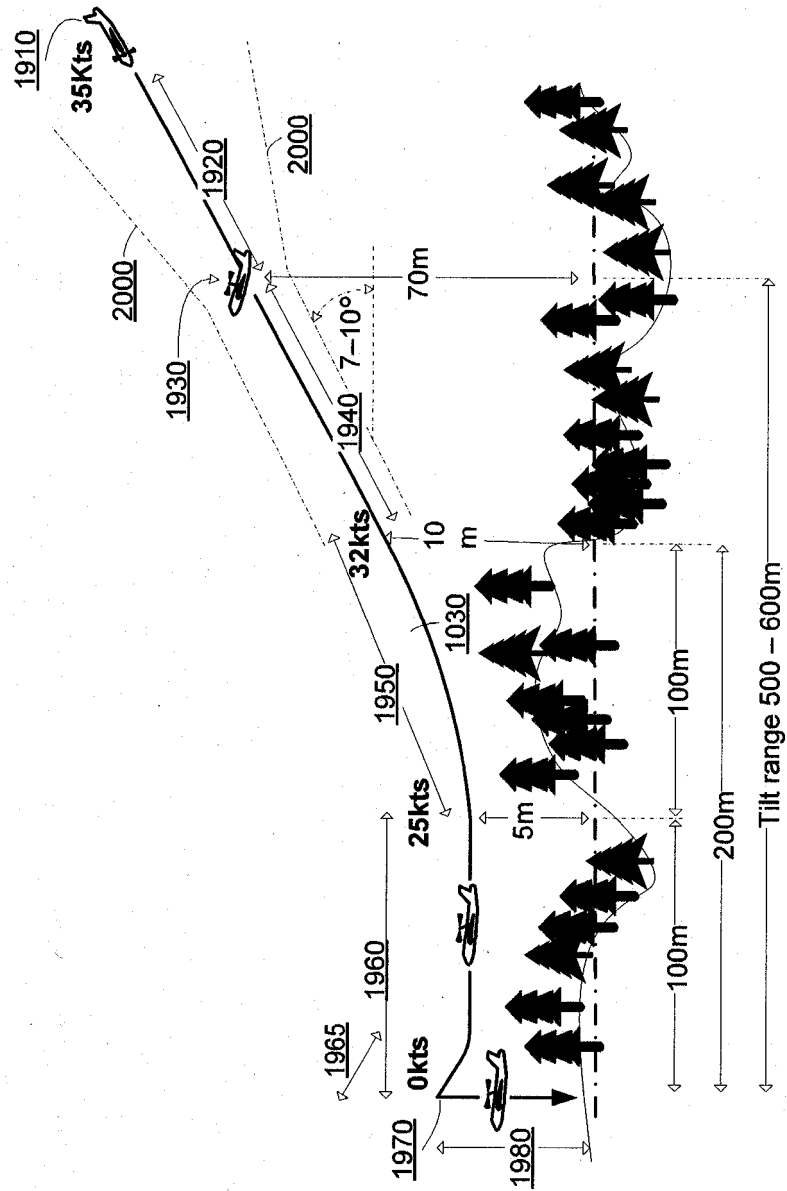


Fig. 7

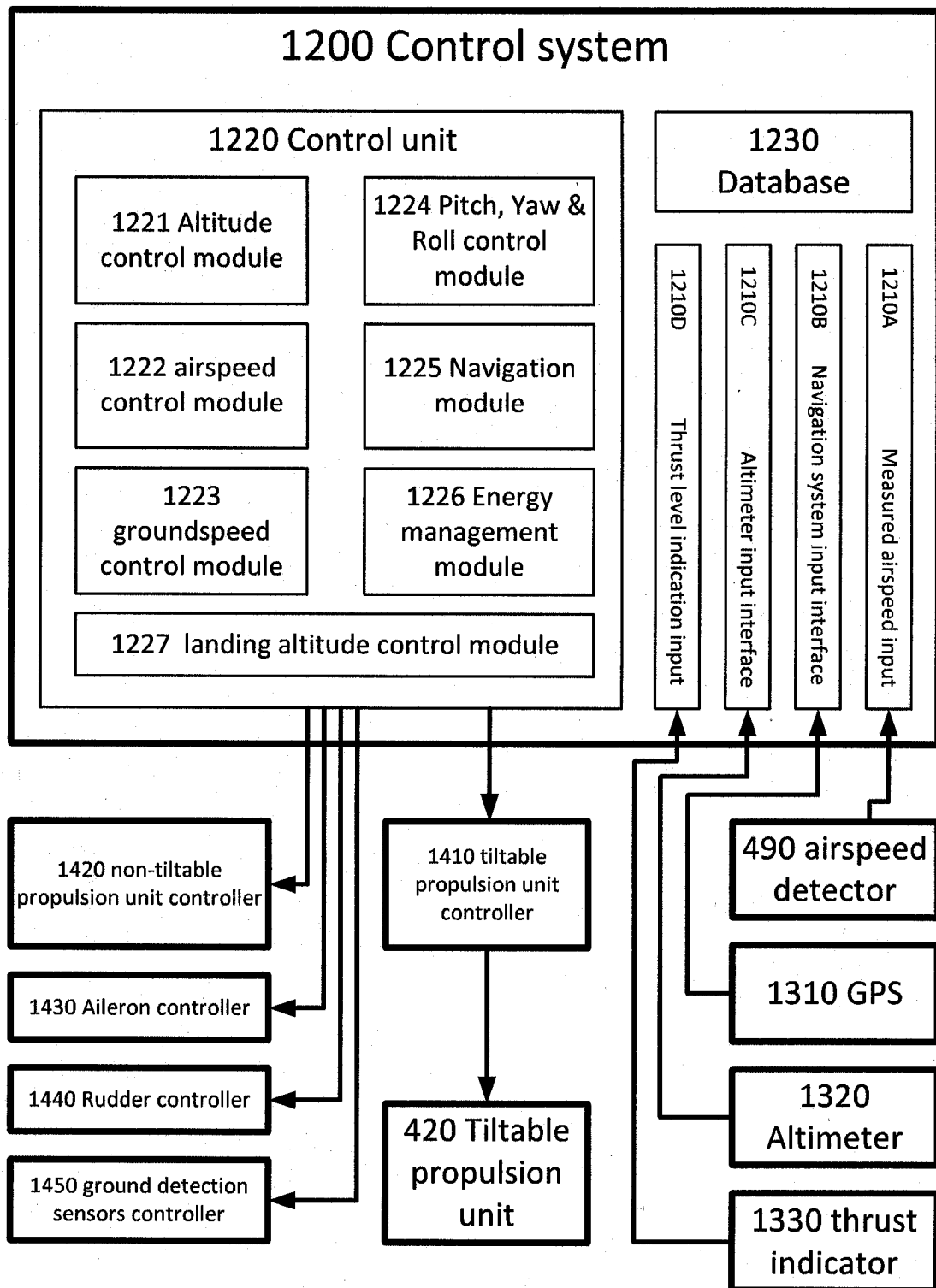


Fig. 8

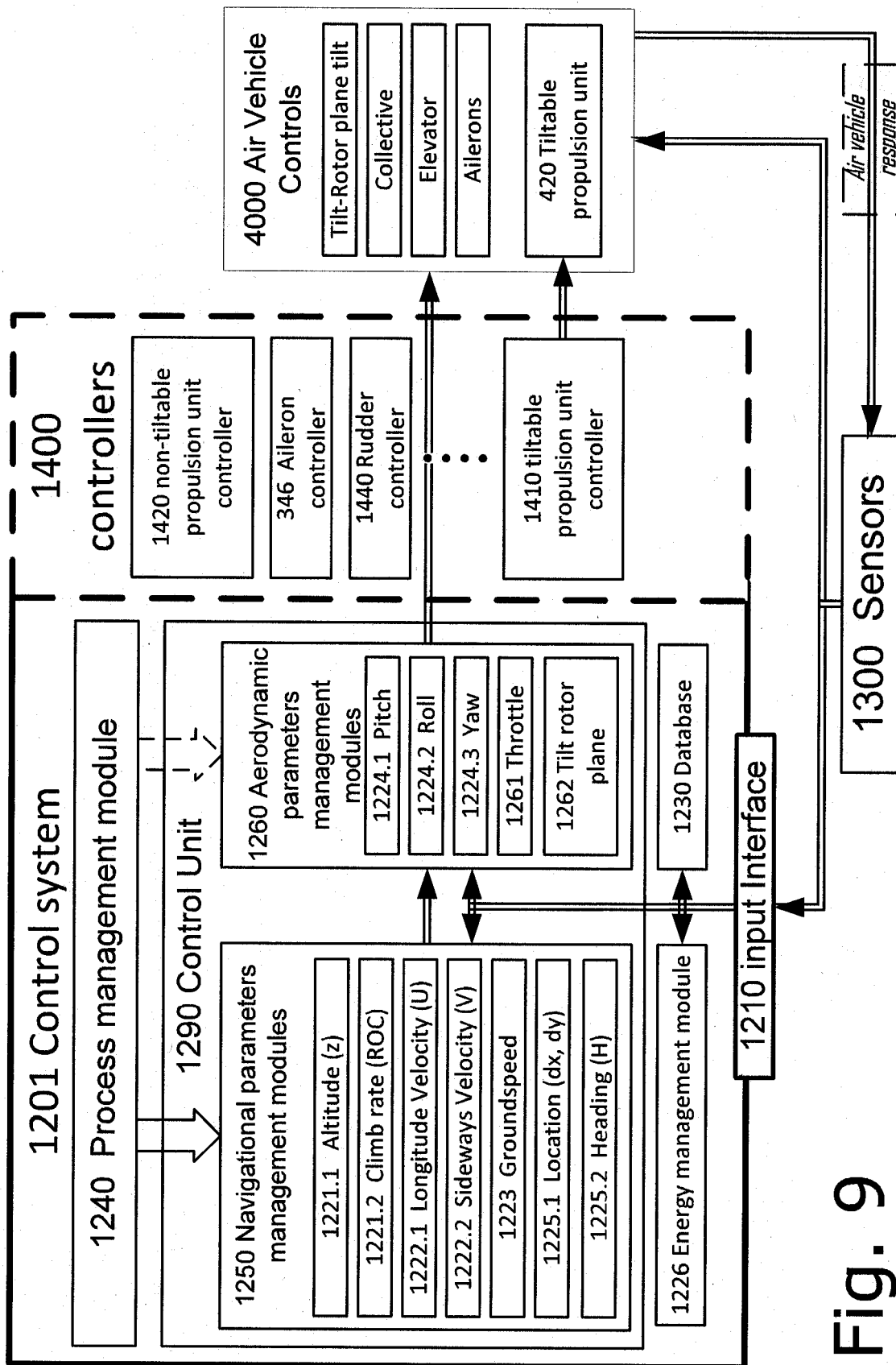
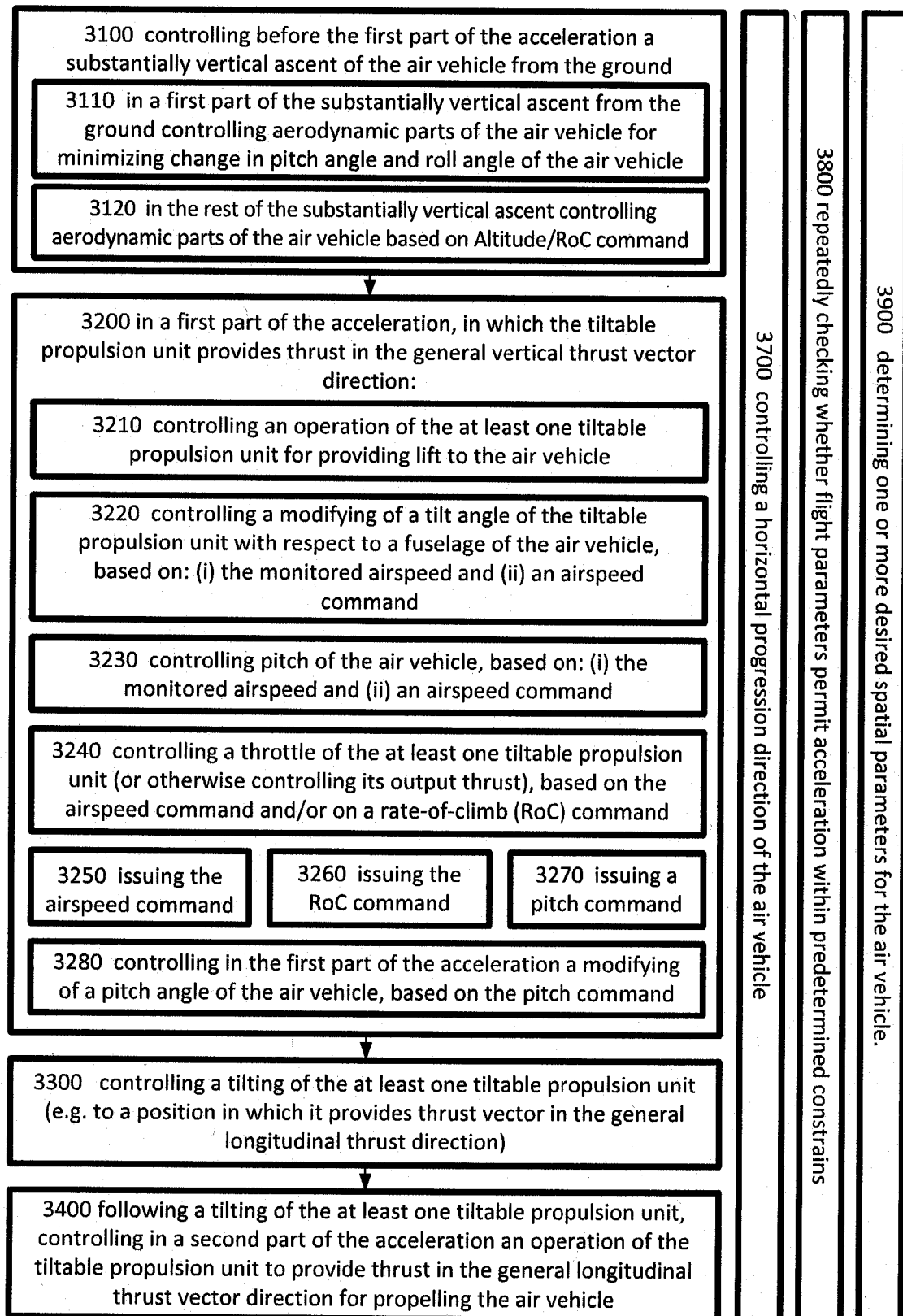


Fig. 9



3000

Fig. 10

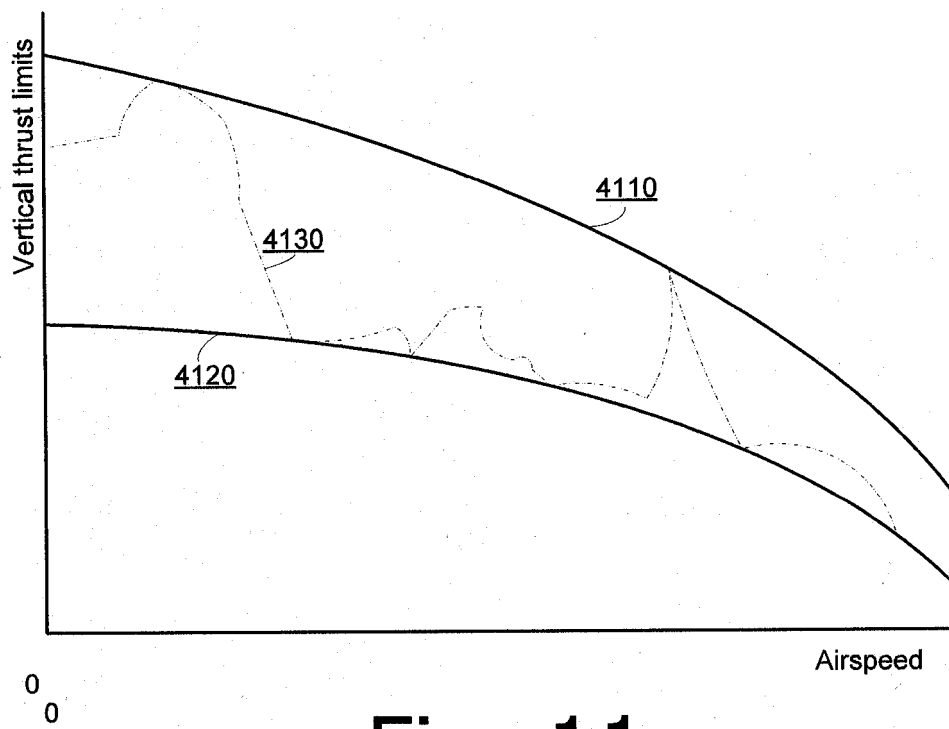


Fig. 11

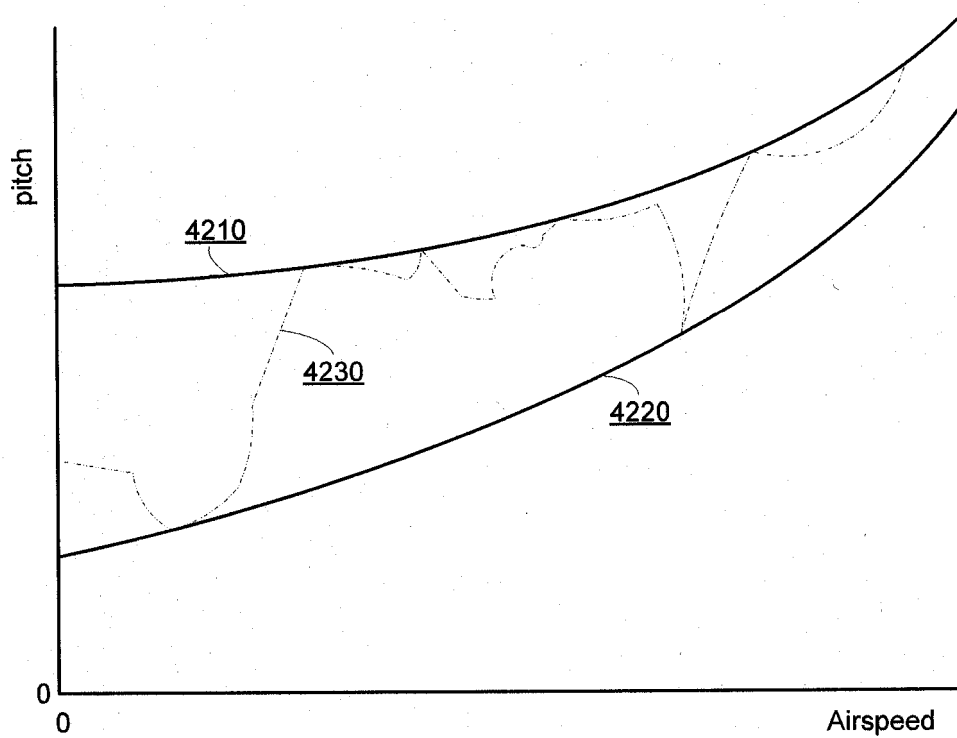


Fig. 12

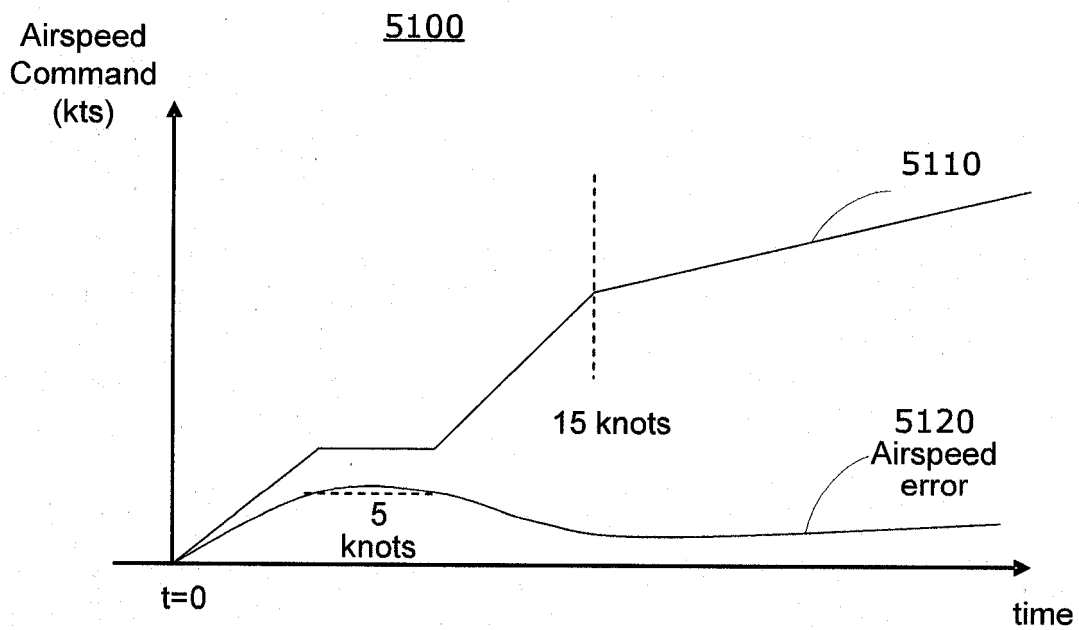


Fig. 13

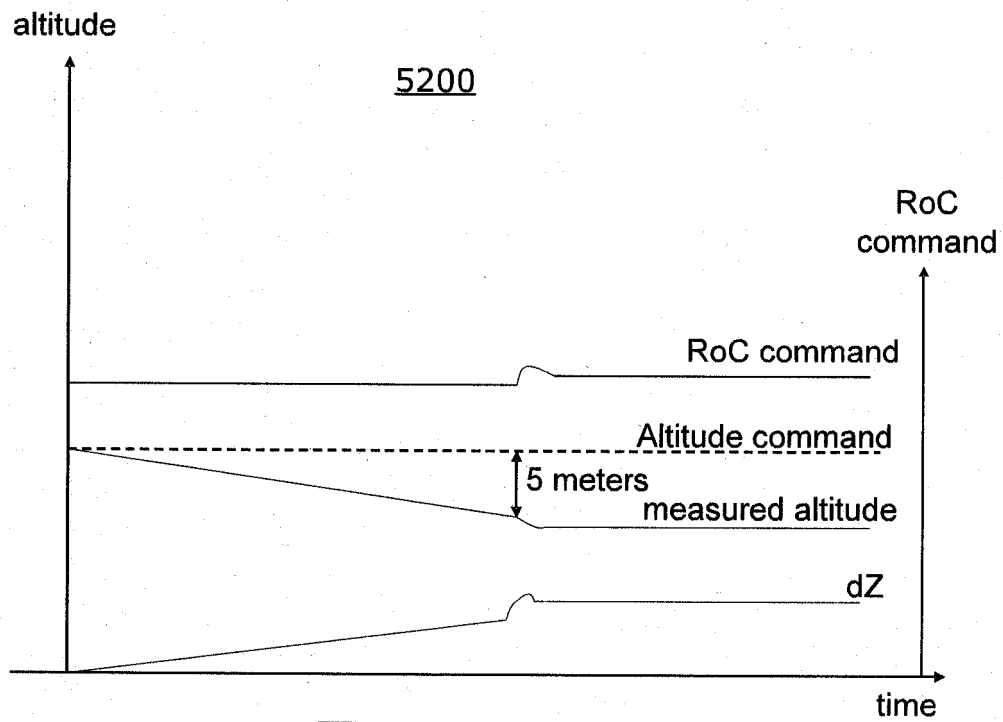
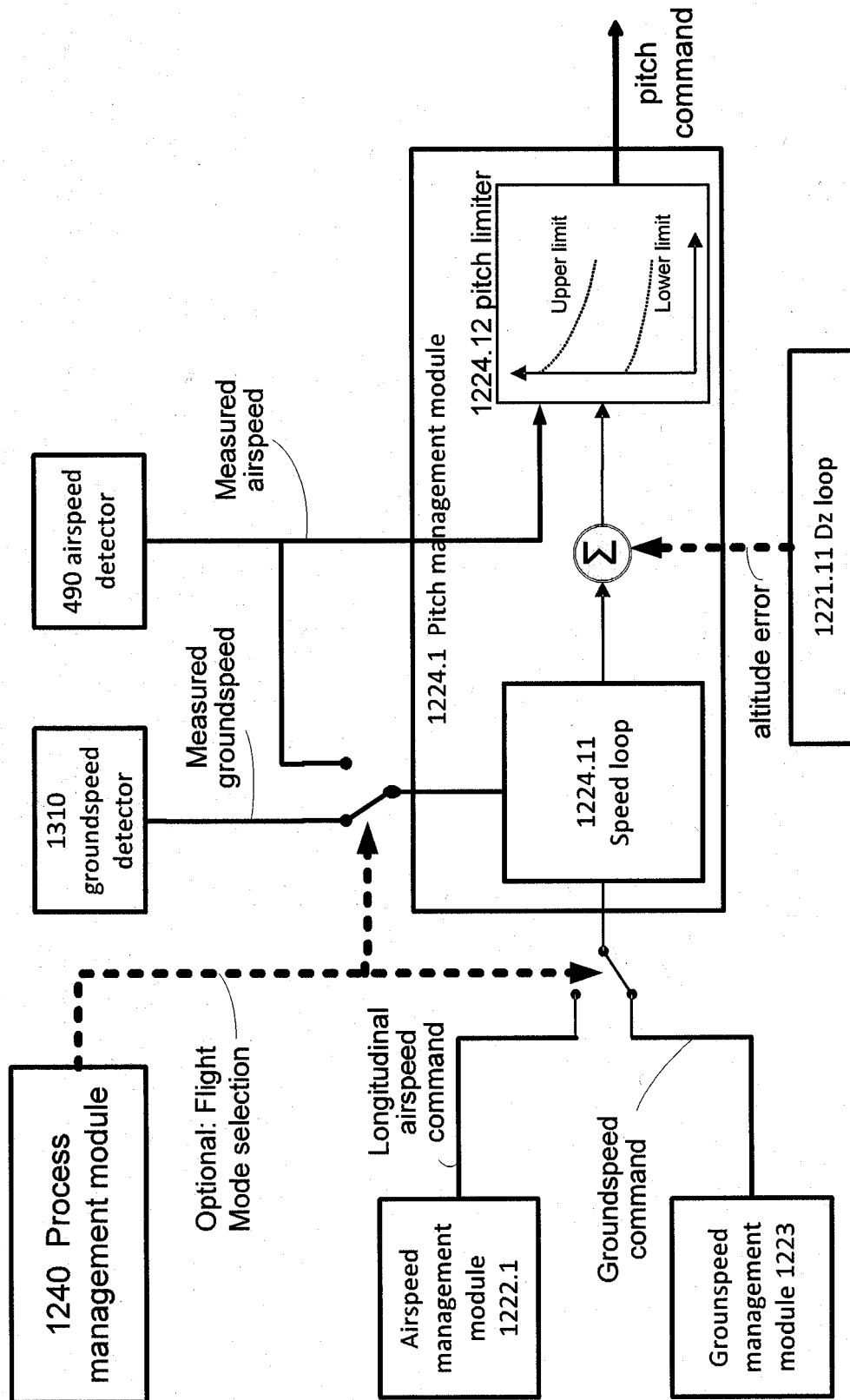


Fig. 16

Fig. 14

Airspeed / groundspeed / pitch channel



Altitude (dz) / rate of climb (ROC) / throttle channel

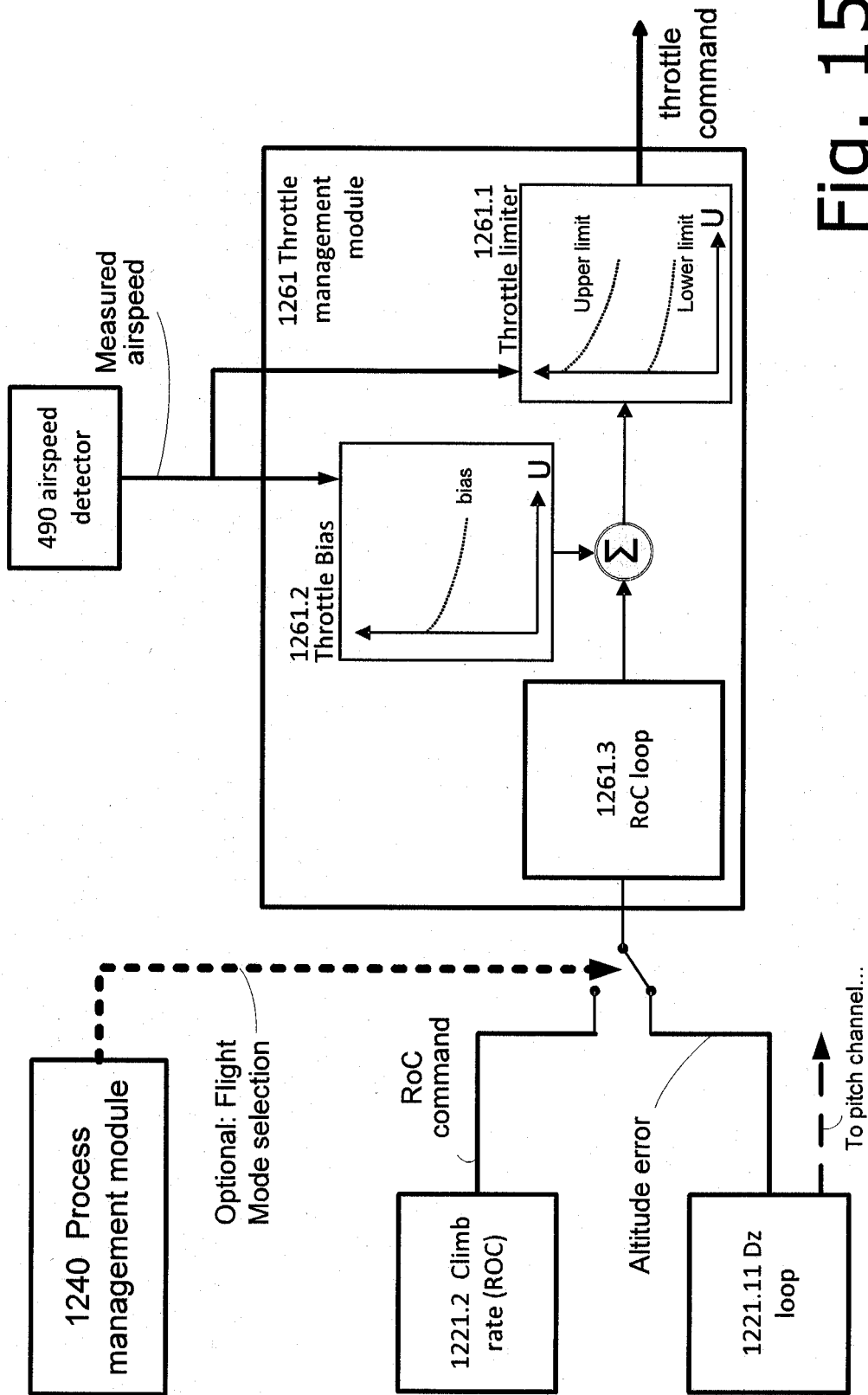


Fig. 15

Inner loop scheme

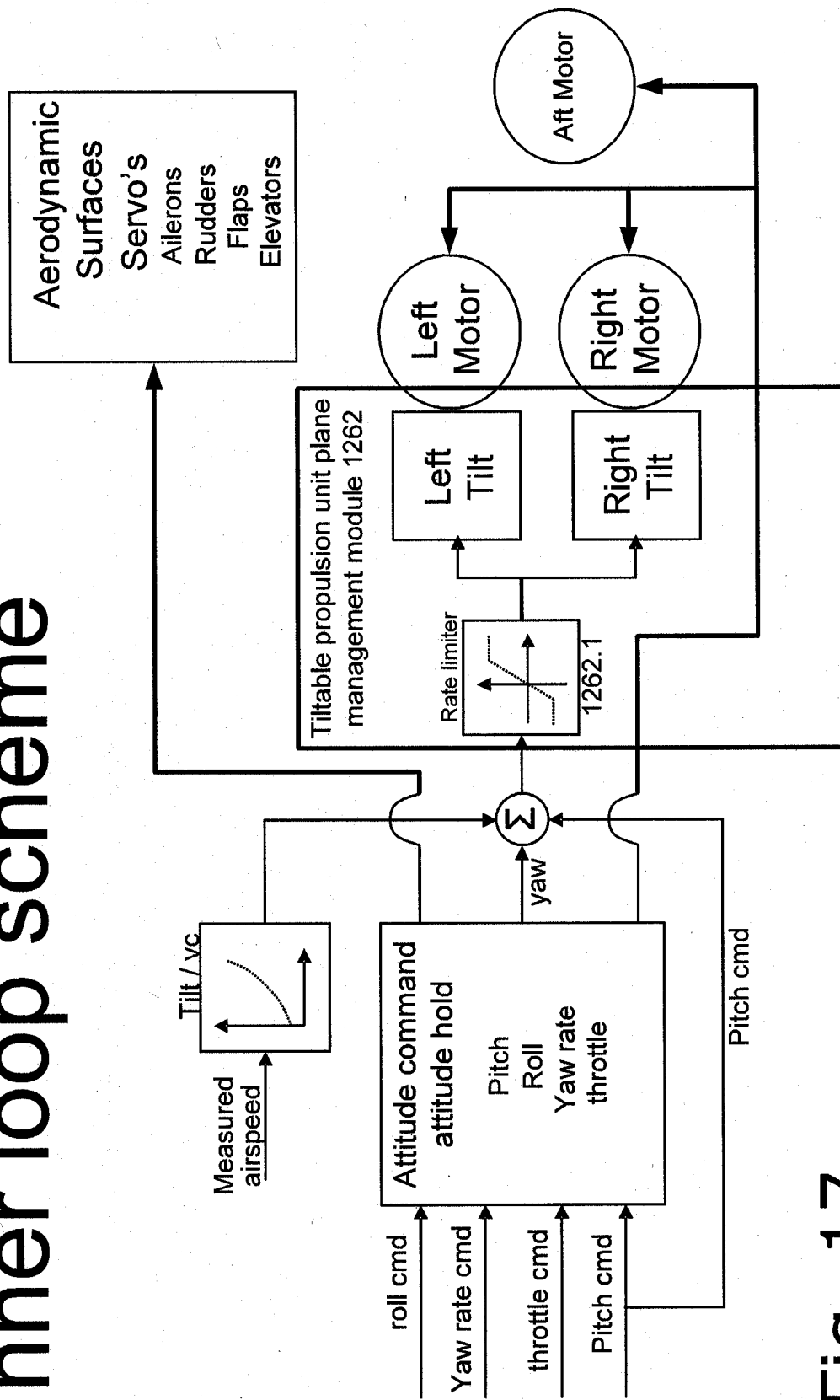
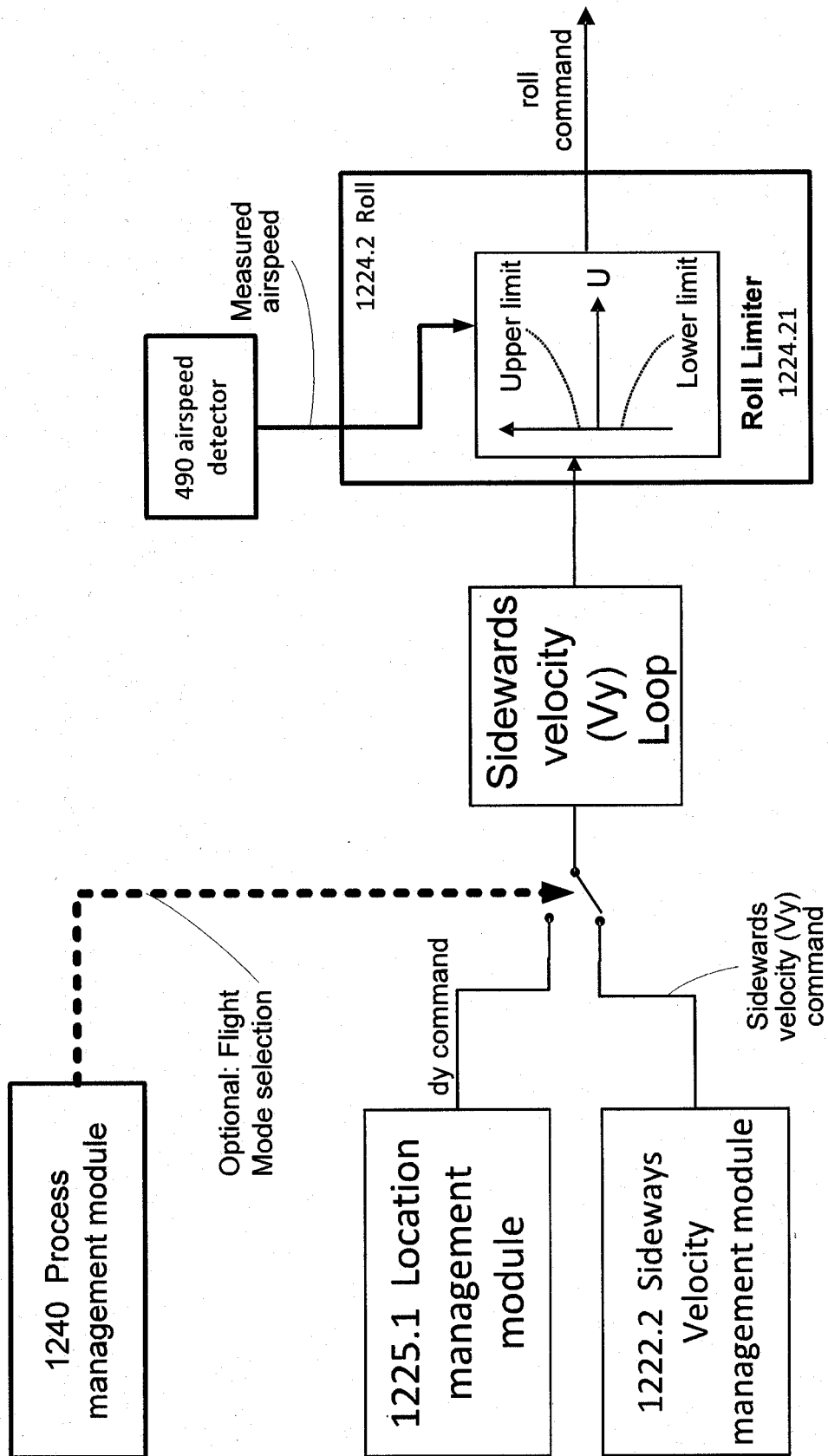


Fig. 17

Fig. 18

dy / sideways velocity / roll channel



	Airspeed command module	Altitude /ROC command modules	Heading command module	Pitch command module	Rotor tilt command module	Throttle command module	Stage Transition rule
3110 "Jump up"	Focus on keeping fixed Yaw and/or Roll	Focus on keeping fixed Yaw and/or Roll	Focus on keeping fixed Yaw and/or Roll	Minimize change to pitch and/or keep horizontal			
3120 "Heave up"	groundspeed based control. If measured groundspeed is low, keep zero, if higher than freeze it	Climb according to RoC command, employ limiters	Freeze heading				When crossing altitude threshold. Possibly also according to timer
3200 Accelerate (switching to airspeed control, instead of groundspeed control)	Employ acceleration command. Optionally, Airspeed command freezes if airspeed error exceeds threshold	Either RoC or dZ command, or RoC with dZ override. Optionally: RoC command is zero below an airspeed threshold and fixed above the threshold.	Initially keep heading, when airspeed increases, allow to bring front against the wind (roll is used to keep direction)	Based on airspeed command and on measured airspeed	Based on airspeed command and on pitch command	Based on RoC command and on airspeed command	When crossing airspeed threshold.
3300 Transition				Pitch, yaw, and roll are preferably froze	Bring rotors to provide thrust in the general longitudinal thrust vector direction	Switch off before, switch on after	When rotors are at the correct position
3400 Climb-out /Normal flight		Climb out per RoC or altitude command		As in the first flight mode	Rotors are tilted forward	As in the first flight mode	

Fig. 19

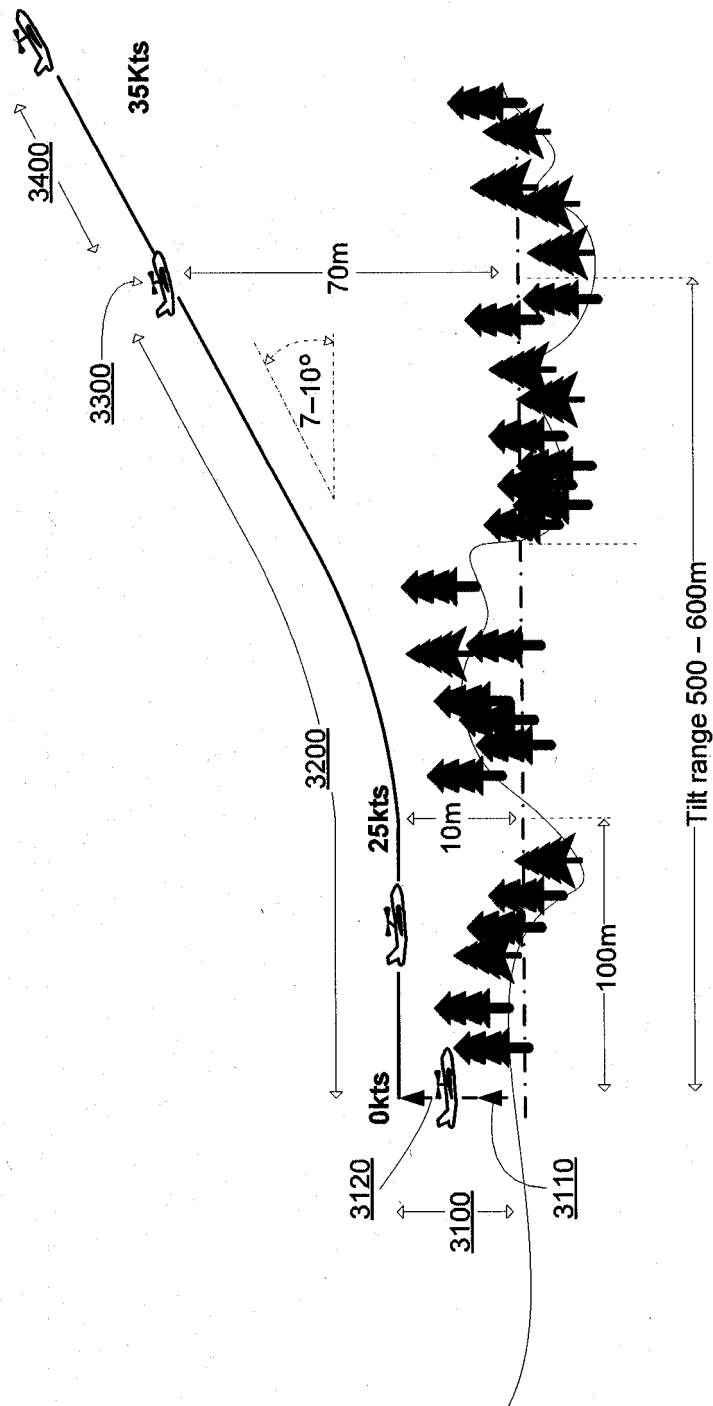


Fig. 20