Ardupilot development news
Rapid development

• The last year has seen about 4k commits go into the ArduPilot main git tree
  – plus lots more in PX4Firmware and PX4NuttX

• More committers
  – we've had a bit over 50 people contribute patches, including lots of new developers

• More code
  – ArduPilot git tree has grown from about 530k lines to about 605k lines of code
Collaboration

- Increased collaboration with PX4 project
  - We have had great collaboration on drivers and infrastructure, and I hope this will grow even more
  - This will be especially relevant as we extend into companion computers, with projects like the ROS bridge

- Great collaboration with 3DR
  - Our core partner is 3DRobotics who have supported ardupilot so much

- More collaboration is good!
  - We have also enjoyed a really good relationship with VirtualRobotix, jDrones, RFDesign and others
  - I expect this will expand to more groups, especially as the capabilities of the ardupilot platform expands through projects like DroneAPI
What have we been up to?

- Continued move to common libraries
  - less vehicle specific code, more common libraries with consistent behaviour
- Consolidating AP_HAL development
  - built upon AP_HAL to make ardupilot more portable and more flexible
  - 3 new ports: FlyMaple, VRBrain and Linux
- Heaps of new features
  - too many to list here. What was your favourite?
What can we do better?

• It should be easier to get into development
  – still more we can do on developer documentation (though a big thank you to Bruce and others for their great work!)
  – we need to make SITL accessible on Windows

• We need faster review and merging
  – too many issues and patches wait for too long
  – I think we need a wider group of patch reviewers
Favourite Topics

- Some of my favourite ardupilot projects at the moment
  - the Linux/BBB port, and the PXF
  - Terrain following, both using SRTM and Lidar
  - Companion computers, and DroneAPI
  - making drones more fun to fly and drive!
Linux/BBB and the PXF

- ArduPilot can now run on embedded Linux
  - initially targetting BeagleBoneBlack, but we expect other boards will follow
  - port is at early stage, yet to get to first flight, but should be soon!
  - 3 great students (Sid, Anuj and Victor) working on it over summer
  - Basic SPI and I2C sensors working, but not reliable yet! (Gyro, Accel, Baro, GPS, Compass, Airspeed)
  - PWM working on PRU
PixHawk Fire Cape
Terrain Following

- Autopilots should make life easier for pilots
  - Missions should be able to specify WPs as AGL
  - RTL should understand the terrain, and not go through a hill!

- How to do terrain following?
  - SRTM data and terrain sensors (primarily Lidars)
  - Store SRTM data on the microSD card, possibly supplemented with MAVLink
  - Use good range finders (Lidars) to detect terrain while flying
Companion Computers

- Lots of small embedded Linux boards available
  - huge amounts of CPU power, low cost (eg. Odroid)
  - enormous potential when combined with ArduPilot as a companion board
  - large memory, fast storage and lots of CPU really changes what a drone can do

- What to use for?
  - situational awareness and live mapping (SLAM)
  - image recognition for S&R
  - environmental monitoring and agriculture
Companion Computers (2)

- Red balloon popping!
  - great example of pairing an Odroid with a Pixhawk
  - MAVLink as the link between autopilot and Linux
  - DroneAPI providing a higher level control platform integrated with existing code via MAVLink

- CanberraUAV search and rescue
  - sophisticated in-aircraft image recognition
  - utilising ground control in a much smarter way
Making drones more fun!

- Drones are different things for different people
  - some just want a stable camera platform
  - some want a work platform for agriculture or S&R
  - many people just want to have fun!
- Autopilots as enablers for people having fun
  - extend what people can do with their vehicles
  - help people to master their vehicles themselves
Making drones more fun! (2)

• How have we made APM:Plane more fun?
  – addition of training mode to help teach people to fly manually
  – addition of acro mode to help people get the most out of their aircraft

• What else can we do?
  – trick mode! prop-hang, knife-edge, maybe rolling loops?
  – virtual dihedral for taming a sports plane for beginners
More information

- Background to the Linux/BBB port

- Future plans for APM development
  - https://groups.google.com/forum/#!topic/drones-discuss/vsSn7g3PSno