How Cheap and programmable private drones came about

Posted At : September 4, 2012 9:40 PM | Posted By : Michael Smith
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Drones are cheap and easy to program - hard to tell what people will do with them ...

At last year's Paris Air Show, some of the hottest aircraft were the autonomous unmanned helicopters—a few of them small enough to carry in one hand—that would allow military buyers to put a camera in the sky anywhere, anytime. Manufactured by major defense contractors, and ranging in design from a single-bladed camcopter to four-bladed multicopters, these drones were being sold as the future of warfare at prices in the tens to hundreds of thousands of dollars.

In May, at a different trade show, similar aircraft were once again the most buzzed-about items on display. But this wasn't another exhibition of military hardware; instead, it was the Hobby Expo China in Beijing, where Chinese manufacturers demo their newest and coolest toys. Companies like Shenzhen-based DJI Innovations are **selling drones with the same capability as the military ones, sometimes for less than $1,000** . These Chinese firms, in turn, are competing with even cheaper drones created by amateurs around the world, who share their designs for free in communities online. It's safe to say that drones are the first technology in history where the toy industry and hobbyists are beating the military-industrial complex at its own game.

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Today, all the sensors required to make a functioning autopilot have become radically smaller and radically cheaper. Gyroscopes, which measure rates of rotation; magnetometers, which function as digital compasses; pressure sensors, which measure atmospheric pressure to calculate altitude; accelerometers, to measure the force of gravity—all the capabilities of these technologies are now embedded in tiny chips that you can buy at RadioShack. Indeed, some of the newest sensors combine three-axis accelerometers, gyros, and magnetometers (nine sensors in all), plus a temperature gauge and a processor, into one little package that costs about $17.

Meanwhile, the brain of an autopilot—the "embedded computer," or single-chip microprocessor, that steers the plane based on input from all the sensors—has undergone an even more impressive transformation, thanks to the rise of the smartphone. Once Apple's iPhone showed that fluid and fast visual interfaces on touchscreens were what people wanted, the same insatiable demand for computational power that kicked in with the graphical user interface of desktop computers came to phones. But unlike the desktop, these mini supercomputers also needed to use as little power as possible. The result was a shift to the hyperefficient "reduced instruction set computing" architectures—led by British chip designer ARM, which now dominates the single-chip industry—driving the performance gains of our smartphones and tablets. As it turns out, these chips are also perfect for drones: Fast and power-efficient processors mean that they can go beyond simply following a preprogrammed mission and start to think for themselves.

And the smartphone-drone connection goes far beyond the processors. These days, a standard smartphone has a full suite of sophisticated inertial sensors to detect its position, a feature that's integrated into everything from games to maps and augmented reality. The demand for higher-quality cameras in phones has launched a similar revolution in image-capture chips, which are used in drones. The need for smaller, better GPS in phones has brought the same technology to drones, too, such that GPS performance that cost tens of thousands of dollars in the 1990s can be had for as little as $10 in a thumbnail-sized device. The same goes for wireless radio modules, memory, and batteries.

In short, this new generation of cheap, small drones is essentially a fleet of flying smartphones.
More and more, autopilot electronics look just like smartphone electronics, simply running different software. The technical and economic advantages of coattailing on the economies of scale of the trillion-dollar mobile-phone industry are astounding. If you want to understand why the personal-drone revolution is happening now, look no farther than your pocket.

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