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https://airpower.airforce.gov.au
Kent, A. (2024) *Air/Space* **3**, bp40968194
Date Published: 17/07/2024

Low-cost mass-produced drones: a tactical advantage

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Air Marshal Chipman, former Chief of the Air Force, announced on the eve of the 2023 *Avalon Air Show* that Australia needs to consider and invest in low-cost mass-produced (LCMP) drones. LCMP drones are those, which either are readily available as off-the-shelf products and/or easily manufactured by sovereign capability, at a cost in the order of $10,000 or less. The announcement acknowledged the sharp rise in the use of LCMP drones recently and their significant contribution to air power. This blog explores some of the roles, advantages and considerations when acquiring this technology.

Roles

Strike. LCMP drones are readily available, easy to operate, difficult to detect and are all-but-immune to conventional anti-aircraft weapons and air defence systems. However, they are not invulnerable as they are susceptible to electronic warfare attacks. Nonetheless, LCMP drones can be used effectively for both Intelligence, Surveillance and Reconnaissance (ISR) and strike. In 2013, the most cutting-edge LCMP drone available to the public was arguably the *DJI Phantom 1*, which had a maximum flight time of around 15 minutes but no built-in imagery capability (Dr Drone, 2024). Compare that to the *DJI Mavic* 3 *Pro*, which has 43 minutes flight time and 4k high definition (HD) video with 28x hybrid zoom capability (DJI, 2024). Improvements like this make them highly effective for innovative applications such as the loitering munition single-use strike as demonstrated by both sides in the ongoing Russia-Ukraine conflict. LCMP drones provide an alternative to artillery for beyond visual line of sight (VLOS) engagement. LCMP drones have been used extensively in Ukraine to seek and destroy targets beyond VLOS, such as in trenches, built up areas and over undulating terrain. Their ability to facilitate the positive identification of their own targets through on board cameras, as well as to strike dynamic targets without the need for 3rd party (laser) target designation makes them extremely versatile.

ISR. In addition to being able to effectively strike targets, LCMP drones are excellent for tactical-level ISR; relaying real time information to frontline forces during combat. The significant improvements to drone technology mentioned above, enables HD video footage to be obtained and relayed with relative ease. Continuing with the *DJI Mavic 3 Pro* as an example, the maximum video transmission range is 8km, which is more than sufficient for tactical ISR. This is 3km further than the aging and expensive *Wasp AE* drones purchased by the Australian Defence Force (ADF) in 2014 (Eshel, 2017).

Advantages

No loss of life. Low-altitude battlefield airspace has historically been the domain of crewed rotary-wing aircraft, but these like other crewed aircraft, are expensive and vulnerable to a variety of tactical air defence systems. In a contested air domain, participating states often have a low appetite for risking assets, which are both costly and slow to replace. In the Russia-Ukraine conflict, crewed aircraft and large strategic drones of both Russia and Ukraine have

very little freedom of movement due to extensive air-defence systems on both sides. This stalemate for control of the air has created a vacuum, necessitating the use of micro and small drones to help fill the resulting capability void. The disposable nature of LCMP drones has facilitated innovation and increased the risk appetite of airframe losses. LCMP drones can be extremely precise and cost a fraction compared to some conventional guided weapons. Even though LCMP drones carry a significantly smaller payload, they prove to be highly effective for kinetic prosecution of both personnel and vehicles, and carry a significantly lower risk of collateral damage.

Availability. The availability of these drones is largely due to the massive surge in their popularity in the civilian market. High quality cameras designed for construction site surveying work equally as well for surveying battlefields, and high performance motors designed for winning drone races also make them excellent candidates for carrying small munitions.

Inexpensive. Fifth generation drone technology, such as that of the *MQ-28A Ghost Bat*, is staggeringly expensive. Australia has committed over $700 million (Airforce Technology, 2022; Minister for Defence Industry, 2024) to the development, production and sustainment of the 13 *MQ-28A Ghost Bat* systems. By comparison, the *DJI Mavic 3 Pro* costs approximately $3000. Obviously, the application of these two systems is completely different and it's not a fair comparison. However, it is this cost difference that enables these drones to be readily available and used at the frontline. Ukraine reportedly plans to purchase 1 million drones in 2024 (Eruygur, 2024). However, it remains unclear who could supply such a large number of drones. It is most likely a combination of off-the-shelf *DJI* products (manufactured in China) and domestically produced LCMP drones from Ukraine's emerging sovereign drone production industry.

Training. Another significant difference is the time it takes to train an operator to be proficient in using these systems. An expensive fifth generation military drone, due to its complexity, takes several months of specialised training. On the other hand, a small off-the-shelf, first-person-view, racing drone takes only approximately less than a month to be combat-ready (Skove, 2023).

Considerations

Hacking. Recently, there have been growing concerns on the possibility of hacking resulting in data breach and/or hijacking when using LCMP drones. The majority of these concerns centre on the *DJI* branded devices following the US' decision to 'blacklist' the company on the grounds of national security (Kuo, 2022). The Australian government and Commonwealth agencies, including the ADF, followed soon after and grounded its fleet of *DJI* devices (Evans, 2023). It is also reasonable to assume that other LCMP drone brands may be vulnerable to similar hacking. Unauthorised third party access to drone imagery, or hijacking, represent a serious security threat, dampening the potential of military employment of LCMP drones.

Conclusion

Despite all these appealing features, LCMP drones have received relatively little attention when it comes to modern military doctrine. The ADF Air Power Manual (7th Ed), published in 2022, only mentions drones twice to briefly pose questions around the ethical considerations of using drones in combat. The application of LCMP drones as strike and ISR assets at the tactical level has proved immensely successful and it seems clear that they will form an integral part of any fighting force in the future. Security issues around hacking of LCMP drones continues to be an area of concern. However, Australia is looking to invest in this technology as well as investing in some counter drone technology such as the *Fractl:2* laser-based counter-drone system (Oderberg, 2024). It is crucial now that this investment, and the subsequent development of doctrine, is able to keep up with the inevitable global military adoption of LCMP drones.

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