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THE REBIRTH OF AERIAL DELIVERY

by Lieutenant-Colonel Mark Matheson

For many years it has been fashionable to decry tactical airlift and, especially, airdrop as being anachronistic — a holdover from the Second World War-era when mass para-drops were a regular feature of combat operations. Given the increased lethality of air defences and the huge cost of military transport aircraft, many commanders questioned the efficacy of such risky operations. However, new technology, combined with emerging operational concepts that call for rapid force projection, distribution-based logistics and a minimal logistics footprint,[1] have produced an aerial delivery renaissance. Rather than being consigned to the scrap heap, airdrop is being recycled as an increasingly effective part of contemporary joint operations.

Theorists have recognized the military potential of vertical envelopment since Leonardo da Vinci first conceived of the parachute.[2] Following the advent of aircraft in the early 20th century, the first operational use of parachutes took place during the First World War. Initially frowned upon by commanders who believed their availability would encourage pilots to abandon ship too readily, other uses quickly developed. While the Royal Air Force could not deliver enough supplies to prevent the British garrison in Mesopotamia from falling in 1916,[3] an increase in payloads that could be carried enabled them, two years later, to save a combined Belgian and French force trapped in the Houthulst Forest in Belgium.[4] This pointed the way to future uses.[5] By the end of the war, aerial delivery had captured the imagination of military strategists everywhere.

During the inter-war period, airborne experimentation was led primarily by the Russians and Germans, and paralleled the development of purposely-designed transport aircraft. Germany subsequently used large numbers of *fallshirmjager* (paratroops)and glider-borne infantry with startling effectiveness at the beginning of the Second World War. Airborne assault played an important role in the fall of Denmark, Norway, Holland, Belgium and France. Nevertheless, after heavy casualties during the invasion of Crete, Hitler decided that the

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element of surprise had been lost and declared the days of parachute forces to be over.[6]

Spurred on by the Axis lead in parachute operations, the Allies created their own airborne forces. Despite considerable heroics, however, the spotty record associated with mass airdrops raised questions about their continued usefulness. Whereas the Sicily drops were a failure, Normandy was an airborne success.[7] Similarly, although the attempt to capture an operational objective at Arnhem failed, the more limited tactical objective of capturing a Rhine bridgehead succeeded a few months later. As a result, although nations continued to invest in airborne forces after the war, consensus developed that the risks associated with aerial delivery limited its utility to emergencies or covert missions.

US Army Photo

Guided Parafoil Air Delivery System, a US Army development, which will enable precision delivery of a payload of about 700 kg from a drop distance of 20 km.

Consequently, there were few airborne operations during the many small but intense conflicts conducted throughout the Cold War.

Two other factors contributed to airdrop's decline. First was the development of specialized military airlift aircraft such as the C-119 'Flying Boxcar' or C-130 Hercules. Not only were these aircraft expensive, they were also critical to deploying forces abroad and projecting strategic power. As national assets, questions arose about risking such valuable resources on limited, tactical missions. Compounding this was the introduction of shoulder-fired, man-portable air defence weapons, surface-to-air missiles and the proliferation of light and medium anti-aircraft artillery. Many people considered such a combination a recipe for disaster — exposing high-value assets over a heavily defended drop zone simply did not make good sense. Against this backdrop, therefore, the future of aerial delivery was bleak.

However, new technologies have been developed that now make it possible to employ tactical airlift assets without undue risk. Precision capabilities and stealth have given tactical airlift new and safer operational characteristics. Rather than following low-level routes and popping up over the drop zone at the last second to minimize exposure to enemy air defences, airlifters can now avoid the threat area entirely. Because of technological advances, it is no longer necessary to over-fly the target to deliver the load accurately. The adaptation of steerable parachutes from the sports world, together with mechanical systems that integrate Global Positioning System (GPS) equipment, make it possible to drop loads with great accuracy from above or outside the enemy air defence envelop. Moreover, because the 'chutes are steerable, offset navigation enables aircraft to avoid hazardous objective areas. This not only enhances mission flexibility and helps protect the aircraft, it also safeguards operational security. Since aircraft no longer have to over-fly the target, there is less risk of revealing the location of the objective before the ground phase of the operation. The use of stealth also offers the potential for enhancing the element of surprise. Although there are no stealth transport aircraft yet in service,[8] the use of stealthy airdrop containers would reduce the radar cross-section of large loads, thereby contributing to operational success. The airdrop of both cargo and personnel is feasible using this technique. In the same way that smart bombs were developed to increase accuracy and reduce risk to delivery platforms, the same 'drop and forget' technology could be applied to airborne operations, thus making the forward delivery of troops and equipment tactically effective once again.

Several new delivery systems are now under development in the United States. The Advanced Precision Airborne Delivery System (APADS) is a high altitude, offset delivery method that incorporates a gliding (ram air) parachute with autonomous GPS navigation. When dropped from above 25,000 feet, the light version is capable of delivering loads of about 800 kilograms within 100 metres of a target, and up to 20 kilometres from the release point. The largest variant can deliver a 19 tonne load with similar accuracy and, when dropped from 35,000, feet is capable of offset ranges up to 40 kilometres. Even more promising, however, is the Semi-Rigid Deployable Wing (SRDW). Essentially a self-inflating hang glider constructed around a rigid internal frame, the SRDW uses servo-actuated wing warping for control. Already able to deliver 275 kilogram loads from 25 kilometres away, the SRDW is capa-

ble of speeds between 30 to 70 knots and has a wind penetration capability. Follow-on developments will allow carriage of up to 2250 kg. Eventually, by using an optional glide augmentation system adapted from ultra-light aircraft and unmanned air vehicles, offset ranges of 80 to 300 kilometres are possible.[9] Future projections also call for improvements in delivery accuracy to within the 10 to 20 metre range.[10]

The scope of applications for precision aerial delivery spans the spectrum of operations. Developed primarily in response to requirements from the Special Forces community, covert operations will undoubtedly be the first to benefit from the use of stealthy precision airdrop. The real progress, however, will occur in missions recently deemed too risky for airborne operations. For example, when used on supply drops, precision airdrop enables 'just-in-time' delivery to become reality. This applies not only to critical high-value items, but also to many routine resupply requirements. In keeping with the Revolution in Military Affairs and its corresponding Revolution in Military Logistics, parallel initiatives aim at reducing the logistics tail and replacing volume (just-in-case) with velocity (just-in-time). Precision airdrop supports that goal by providing rapid, precise, low-cost delivery that does not rely on ground transport or expose tactical helicopters to dangerous landing zones. Indeed, with increased accuracy, many smaller and less vulnerable drop zones become available. Furthermore, since a single aircraft can service multiple DZs from a single release point, tactical flexibility will also increase.[11]

Precision airdrop is particularly well suited to the emerging non-linear battlefield. The United States Marine Corps has begun experiments in support of its sea-based logistics concept that emphasizes resupply from the sea.[12] During its Hunter Warrior Advanced Warfighting Experiment at Camp Pendleton, California, in 1997, six Guided Parafoil Air Delivery System Light (GPADS-L) airdrops provided cache pre-positioning and troop resupply.[13] Precision aerial delivery also has potential for resupplying forces engaged in fighting in built-up areas that are cut-off or where resupply over the ground is dangerous. Had such a capability been available to the forces sent to rescue the downed Blackhawk helicopter crews in Mogadishu, the outcome might have been very different. Because of its inherent flexibility, some believe that precision airdrop will no longer be just an emergency logistics resupply capability,[14] but could lead to the return of mass airdrop operations. Cost may be the only limiting factor for routine use. While it is pure speculation, one might even imagine the return of glider forces using stealth platforms.

Other uses are also possible. Offset capability, stealth and precision will enable joint forces to respond to a broader range of missions. Given their new, covert, all-weather capability, transport aircraft could carry non-traditional loads such as sensors and munitions. One possible application of this technique is the aerial mining of littoral areas. The large payload capacity of transport aircraft would be a considerable advantage in such a role. Increased accuracy could also make aerial delivery useful for replenishment at sea. Rather than complicated evolutions and jackstay transfers, precision aerial delivery could make it possible to deliver loads directly onto the decks of ships. While it would still be necessary to retain replenishment vessels to provide fuel, such a development would reduce their exposure in the operational area and permit redesign to reduce cost and vulnerability. Large ships are not only more expensive, they are also bigger targets.

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C-130 Hercules, the workhorse of the Canadian cargo-carrying fleet. Suggestions have been made that part of the Hercules fleet should be replaced with a smaller number of the more versatile American built C-17 Globemasters.

Finally, precision airdrop is ideally suited to humanitarian missions. By employing accurate airdrop technology, aircraft can deliver foodstuffs directly to those in need without adverse collateral effects. Precision airdrop also has considerable potential in Search and Rescue. Several years ago, the survivors of a stricken Panamanian vessel perished because they could not get to a survival kit dropped to them by a

US Army Photo

Semi-Rigid Deployable Wing, developed by the US Army to provide precision delivery of cargo (when coupled with a GPS guidance system) without the delivery aircraft having to fly anywhere close to the delivery point.

Canadian C-130 because of high seas and heavy weather. Unfortunately, such incidents are all too common. With highly precise airdrop, however, rescue units will be able to prevent loss of life by delivering survival gear directly to the people in distress. Besides Search and Rescue, other potential applications include disaster relief missions such as floods and forest fires.

Everything old is new again. After decades of stagnation, the development of offset delivery, precision airdrop and stealth capabilities have made it possible for tactical airlift once again to make a significant contribution in joint operations. Evolving war fighting concepts appear to demand lighter, more versatile and mobile forces. Besides reinforcing the traditional doctrine of rapid power projection, precision airdrop enables forces to reduce their logistics tail and replace volume with velocity. Moreover, because of its inherent flexibility, innovative new roles and missions are also possible.

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NOTES

1. Nancy Harrington and Edward Doucette, "Army After Next and Precision Airdrop," *Army Logistician*, Vol. 31, No. 1 (January-February 1999), p. 46.
2. Da Vinci (1462-1519) developed rudimentary parachute sketches around 1514-1516. Jesuit Father Francesco de Lana (1631-1687) later proposed developing an "aerial ship" for military purposes. After drawing an aerial vessel held aloft by four spheres "empty of air," de Lana was the first to theorize about the techniques of invasion from the air. *A History of Flying* (London: B.T. Batsford Ltd, 1953), pp. 50-51.
3. Michael Armitage, *The Royal Air Force – An Illustrated History* (London: Arms and Armour Press, 1993), p. 29.
4. Hilary St George Saunders, *Per Ardua – The Rise of British Air Power 1911-1939* (London: Oxford University Press, 1944), p. 277.
5. One early visionary was Colonel William "Billy" Mitchell who proposed using bombers to drop an infantry division to capture the city of Metz. The armistice precluded the plan's execution. Isaac Don Levine, *Mitchell – Pioneer of Air Power* (New York: Duell, Sloan and Pierce, 1958), pp. 146-151.
6. Operation "Merkur" resulted in 6000 casualties and over 150 lost transport aircraft. Anthony Farrar-Hockley, *Student* (New York: Ballantine Books, 1973), pp. 31-47 & 134. The Luftwaffe reinforced Hitler's reservations about airborne operations the following year when they failed to relieve von Paulus' Sixth Army at Stalingrad.
7. The Sicilian drop suffered from poor navigation that scattered the force across the countryside and into the Mediterranean where many troops drowned. Ironically, soggy drop zones also produced casualties on D-Day. David Wragg, *Airlift* (Novato CA: Presidio Press, 1986), pp. 50-56.
8. Because of its small radar cross-section, there have been concerns about North Korea's use of the canvas and wood built An-2 'Colt' for commando insertion; however, it is not a true stealth aircraft. On the other hand, it may be possible to modify the bomb bay of the B-2 Spirit to deliver certain payloads. Bombers often served as aerial delivery platforms during the Second World War. Designed to replace the C-130 starting around 2015, Boeing's developmental Advanced Tactical Transport nicknamed 'SuperFrog' would be the first stealth transport. David A. Fulghum, "Bombers, Missiles Stay In Long-Range Plans," *Aviation Week & Space Technology*, Vol. 150, No. 21, (May 24, 1999), p. 84. Also, Bill Sweetman, "Load Warriors," Popular *Science*, Vol. 255, No.1, (July 1999), pp. 52-55.
9. Andrew C. Braunberg, "Parachute Guidance Empowers Programmed Payload Placement," *Signal*, Vol. 50, No. 5, (May 1996), pp. 83-85. Larry W. Williams, "Technology Breakthroughs Will Breed Super Warriors for Special Operations," *National Defense*, Vol. LXXXI, No. 519, (July/August 1996), p. 51. Also, SBCCOM Online, available: http://www.sbccom.army.mil/products/airdrop.htm.
10. Harrington and Doucette, "Army After Next and Precision Airdrop," p. 46.
11. *ibid*, p. 46.
12. Williams, "Technology Breakthroughs Will Breed Super Warriors for Special Operations," p. 51.
13. Harrington and Doucette, *op. cit.*, p. 47.
14. *ibid*, p. 46.