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The use of barrel bombs by the Syrian government

1. Barrel bombs are a type of improvised explosive device (IED) consisting of a suitably-sized container filled with an explosive payload and shrapnel, chemicals, oil or other content to increase its destructive capacity, which are dropped from a helicopter or cargo aircraft.
2. Barrel bombs have been widely used by the Syrian military since the uprising began in 2011. Evolving designs and tactics have resulted in barrel bombs of greater destructive power being dropped indiscriminately on populated areas.
3. There are a number of possible motives for the Syrian government's use of barrel bombs, but it is *likely* that their role as an effective weapon of terror is driving the ongoing widespread deployment of these weapons.
4. Barrel bombs are a simple design that can be made from easily-obtainable components, which makes them more attractive than conventional bombs for use as a weapon of terror, as they can be widely deployed at a low cost.
5. Barrel bombs are being dropped from Soviet/Russian-made Mil Mi-8/17 (Hip) transport helicopters and Mi-24/25 (Hind) attack helicopters in the majority of cases identified in Syria.
6. Spare parts for these helicopters are *almost certainly* coming from existing stores or being cannibalised from unserviceable aircraft. It is also *highly likely* that they are coming from Oboronprom and other Russian suppliers.
7. It is *likely* that the Syrian government is able to purchase spare parts from commercial suppliers in former Warsaw Pact countries without facing sanctions, or from corrupt Western companies willing to evade sanctions. It is also *possible* that it is able to obtain spare parts from friendly countries that have their own fleet of Mil helicopters, such as Iran, or countries that produce Mil helicopters under license, such as China.
8. Although Syria is known to possess a number of French-made Aérospatiale SA-342s (Gazelle) and possibly some US-made Bell Huey-type helicopters (from Iran), the Gazelle's are not able to carry barrel bombs and there are no known incidences of Hueys being used to drop barrel bombs.
9. It is therefore *unlikely* that targeting helicopter manufacturers or spare-part suppliers will be an effective advocacy strategy for international non-governmental organisations wishing to put pressure on the Syrian government to end its use of barrel bombs.



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Introduction

Barrel bombs are a type of improvised explosive device (IED) dropped from the external pods or cargo bay of a helicopter or rolled out of an aircraft's rear cargo door. They are made by filling a barrel or other suitably-sized container with an explosive payload and adding shrapnel, chemicals, oil or other items to increase its destructive capacity.

The first known use of barrel bombs was in Sudan, where they were deployed against rebels and civilians in Darfur in the 1990s. Khartoum has since used them when the Sudan Liberation Army and the Justice and Equality Movement rebelled in early 2003, and again in late 2011 after the succession of South Sudan.

The forces of Syrian President Bashar al-Assad have further refined the weapon and the tactics used when deploying it. The earliest recorded use of barrel bombs in Syria was in August 2012.¹ Their use was then confirmed by a leaked video from October 2012 showing members of the Syrian military dropping barrel bombs from a Mil Mi-8/17 (Hip) helicopter.²

Evolving tactics have made the use of barrel bombs far more dangerous for civilians. When barrel bombs were first deployed by Syrian government forces, they were dropped from helicopters at low altitude, providing a level of accuracy that allowed specific targets to be bombed. However, once the rebels acquired shoulder-launched surface-to-air missiles (SAMs), they were able to target these low-flying helicopters. This forced the pilots to fly at much higher altitudes, which resulted in greatly-reduced accuracy. This change in tactics meant that the government was no longer able to bomb specific targets, and barrel bombs are now used to attack large urban areas.³

Furthermore, the barrel bombs being used in Syria have developed from simple versions using a burning wick fuse, which were poorly made and badly designed, to more-complex munitions using an impact fuse and containing 2,000 pounds of explosive or more.

This combination of indiscriminate use and greater destructive power has resulted in more-widespread urban destruction and higher numbers of civilian casualties.

In neighbouring Iraq, Prime Minister Nouri al-Maliki seems to have taken his cue from Assad. The Iraqi Army is thought to have used barrel bombs against tribal militia and fighters from the Islamic State of Iraq and the Levant (ISIS) in Fallujah in 2013-14 and against ISIS fighters in Mosul, Tikrit and Baiji in mid-2014. This is a further worrying development in the state use of low-accuracy, high-lethality IEDs.

¹ <http://brown-moses.blogspot.co.uk/2012/08/the-mystery-of-syrian-barrel-bombs.html>

² <http://brown-moses.blogspot.co.uk/2012/10/clear-evidence-of-diy-barrel-bombs.html>

³ <http://brown-moses.blogspot.co.uk/2013/12/syrias-barrel-bomb-technology-relative.html>

Why is the Syrian government using improvised barrel bombs?

Although the Syrian government continues to deny that they are using barrel bombs, there is considerable evidence to suggest the contrary. User-generated video hosting sites, such as YouTube, are awash with footage of Syrian military helicopters dropping crude devices on rebel-held areas,⁴ and numerous photographs of unexploded barrel bombs are circulating on the internet.⁵ Human rights monitors in these areas have also collated considerable eye-witness and forensic evidence.⁶ It is estimated that between 5,000 and 6,000 barrel bombs have been dropped since the uprising in Syria began in March 2011, with the bombing campaign focussed on rebel-held areas of Aleppo.⁷ The opposition Syrian National Council claims that at least 20,000 people have been killed as a result.⁸

It should be noted, however, that there have been many attacks in Syria that have been mistakenly attributed by civilians and the international media to barrel bombs, when they were more likely due to conventional bombs, which have a considerably higher reliability and destructive power than improvised ordnance.⁹ In short, barrel bombs are being used *in addition to* conventional bombs, not *instead of*.

But the question remains as to why the Syrian government has resorted to the widespread use of an improvised device, and barrel bombs in particular? Although it is impossible to ascertain from open sources the exact reasons for the Assad regime's decision to supplement its conventional arsenal with barrel bombs, it is possible to identify and assess several realistic possible motives behind their use:

1. Low supply of conventional weapons
2. High losses among conventional launch platforms
3. Defections by pilots
4. Effective weapon of terror
5. Simple design, easy manufacture and rapid deployment
6. Easily-obtained components

Low supply of conventional weapons: Given the lack of accuracy and potentially high unexploded-ordnance rate, barrel bombs are not the weapon of choice for state militaries. The Syrian military maintains an arsenal of far more destructive Soviet/Russian air-to-surface missiles, high-explosive bombs, blast bombs, cluster bombs, incendiary bombs and fuel-air bombs.¹⁰ It is possible that they are deploying barrel bombs when these conventional munitions are unavailable, stocks are running low or there are concerns over resupply. However, the continued widespread use of conventional munitions by the Syrian military demonstrates a healthy inventory. Syria can also almost certainly obtain weapons from Russia and possibly Iran. Thus, a shortage of conventional ordnance is unlikely to be a significant factor driving the government's use of barrel bombs.

⁴ http://www.youtube.com/results?search_query=syria+barrel+bombs

⁵ <http://brown-moses.blogspot.co.uk/2013/12/syrias-barrel-bomb-technology-relative.html>

⁶ <http://www.hrw.org/news/2014/04/28/syria-new-barrel-bombs-hit-aleppo>

⁷ <http://www.channel4.com/news/syria-anniversary-barrel-bombs-war-crime-war-russia-ukraine>

⁸ <http://www.ft.com/intl/cms/s/0/fe9dcccfc-95a1-11e3-8371-00144feab7de.html>

⁹ <http://brown-moses.blogspot.co.uk/2013/12/syrias-barrel-bomb-technology-relative.html>

¹⁰ <http://brown-moses.blogspot.co.uk/2012/09/the-weapons-of-syrian-air-force.html>

High losses among conventional launch platforms: The Syrian military is equipped with very capable Soviet/Russian attack aircraft in the form of the Su-22 (Fitter), Su-24 (Fencer), MiG-21 (Fishbed), MiG-23 (Flogger), MiG-25 (Foxbat) and the MiG-29 (Fulcrum). They also have the Mi-2 (Hoplite), Mi-6 (Hook) and Mi-8/17 (Hip) transport helicopters and the Mi-24/25 (Hind) and SA-342 (Gazelle) attack helicopters.¹¹ However, a significant factor is that attack jets need to fly at low altitudes in order to drop unguided bombs accurately, as do attack helicopters in order to use their rockets and missiles. This makes them vulnerable to SAMs and ground-based anti-aircraft and small-arms fire. One estimate is that the Syrian rebels have shot down more than 40 military aircraft since the start of the conflict.¹² This situation has been exacerbated by aircraft lost in accidents, destroyed in rebel attacks on airbases or grounded by a lack of spare parts. While data on the exact number of operational aircraft currently in Syria's inventory is difficult to obtain, it is believed that Syria had between 450 and 750 fixed-wing aircraft and 170 to 210 helicopters at the start of the conflict.¹³ Even accounting for the selective reporting of losses and the unknown number of aircraft destroyed on the ground or needing repair, it is still reasonable to believe that the Syrian military maintains a considerable number of aircraft in operational use.

Defections by pilots: Defections among pilots, especially attack-jet pilots, is another important factor. The loss of skilled pilots and their aircraft is compounded by a growing fear within the Syrian government that more will follow, handing public relation victories to the rebels and further undermining the Syrian military's strength. A Syrian defector reported that two-thirds of bomber pilots have been grounded due to a lack of trust by commanders and fears that more might defect with their aircraft.¹⁴ In this situation, barrel bombs become an attractive option because they can be easily deployed from transport helicopters hovering high over the target.

Effective weapon of terror: Being unguided and having no accurate aiming system makes barrel bombs inherently indiscriminate and thus a highly potent weapon of terror. The widespread use of these weapons against civilian targets, such as schools, mosques and residential areas, means that even the sound of an overhead helicopter now provokes considerable fear among a town's inhabitants, without that helicopter even having to drop a bomb. Barrel bombs spread fear among non-combatants in rebel-held areas, which may lead to the increasing alienation of the rebels from the civilian populace. Despite the unanimous passing on 22 February 2014 of UN Security Council Resolution 1239 calling for all parties in Syria to stop using indiscriminate weapons (including barrel bombs) in populated areas,¹⁵ the use of barrel bombs continues to be sanctioned by the Syrian leadership with ongoing impunity. Human Rights Watch and the British foreign secretary have called their use a war crime. It is assessed that the most likely reason for the ongoing widespread deployment of barrel bombs by the Syrian government is their use as an effective weapon of terror.

¹¹ <http://www.globalsecurity.org/military/world/syria/airforce-equipment.htm> and

<http://www.airforce-technology.com/features/featurerussia-with-weaponry-syrias-air-force/>

¹² http://www.ejection-history.org.uk/CONFLICTS/SYRIA_2011_2012/Syrian_Conflict.htm

¹³ <http://www.globalsecurity.org/military/world/syria/airforce-equipment.htm>

¹⁴ <http://www.thenational.ae/news/world/middle-east/syrian-fighter-pilot-defects-to-rebel-cause-attacking-assad-loyalists>

¹⁵ [http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/2139\(2014\)](http://www.un.org/en/ga/search/view_doc.asp?symbol=S/RES/2139(2014))

Simple design, easy manufacture and rapid deployment: Barrel bombs follow a simple design that allows for basic construction and mass production. A high explosive, such as trinitrotoluene (TNT) or an ethylene oxide-based compound, is housed in a suitable metal drum or container, together with shrapnel and sometimes oil for an incendiary effect or chlorine to make a chemical weapon. This creates a destructive effect in contrast to their rudimentary design. The Syrian military have switched from using unreliable wick fuses to impact fuses, and have added fins to the barrel to ensure that the impact fuse on the base hits the ground first. This design is constantly evolving as the military seeks to reduce the failure rate. The unsophisticated design and basic components of barrel bombs (especially those using wick fuses) allows for mass manufacture by relatively unskilled labour in simple local workshops. This allows them to be rapidly deployed as operational assets.

Easily-obtained components: Another advantage of barrel bombs is that their improvised nature means that components cannot be effectively stopped by international sanctions. The materials are widely available from multiple sources within Syria, and there is no realistic way of preventing the military from obtaining them. Even inspections by international monitors would not be effective. This, combined with their simple design and rapid deployment, makes barrel bombs more attractive than conventional bombs as a weapon of terror, as it allows for their mass deployment at a low cost.

Which countries are the helicopters and their spare parts coming from?

Accurate identification of the specific variant of helicopter type being used to deploy barrel bombs is necessary in order to ascertain with certainty which country or countries the helicopters, and potentially their spare parts, have been supplied by. This is because different variants of the same helicopter type are often developed for domestic and export markets, with specific identifiable variants in service with different militaries around the world. However, imagery analysis of the helicopters used to deploy barrel bombs in Syria has been inconclusive, as the available photographs and video footage is not of high enough resolution to allow accurate identification of the variants of aircraft being used. Conclusions can, however, still be drawn on the type of helicopters used.

An analysis of the collected footage reveals four identifiable types of helicopter being used to deploy barrel bombs in Syria: the Mi-2 (Hoplite), Mi-6 (Hook), Mi-8/17 (Hip) and Mi-24/25 (Hind). The majority of missions appear to be using the Hip and Hind platforms. These are all Soviet/Russian helicopter types, which is unsurprising given that pre-war Syria was the largest importer of Russian-built weapons and weapons platforms in the Middle East. These helicopters would have been made in the Soviet Union or Russia by the Mil Moscow Helicopter Plant, which has been part of the majority state-owned Oboronprom Corporation since 2004.

A chronology compiled from the dates of the collected footage suggests that barrel bombs are being increasingly launched via the external pods of helicopters. From this it can be inferred that impact-fuse bombs are being favoured over the wick-fuse models prone to premature detonation, as wick-fuse models cannot be dropped from external pods. This also means that the Syrian military can utilise their Hind fleet more, as that helicopter has external pods while lacking a rear cargo door, thus increasing the pool of available launch platforms for barrel bomb operations.

It is almost certain that spare parts for these helicopters are coming from existing stores or being cannibalised from unserviceable aircraft. It is also highly likely that spare parts will be coming from Oboronprom and other Russian suppliers. Syria may also be able to obtain spare parts from friendly countries that have their own fleet of Mil helicopters, such as Iran, or countries that produce Mil helicopters under license, such as China, which produces the Mi-8/17 (Hip) at its Sichuan Lantian Helicopter Company Ltd production facility. The government may also be able to purchase spare parts from commercial suppliers in former Warsaw Pact countries without facing sanctions, or from corrupt Western companies willing to evade sanctions. It is worth noting that there are passenger-helicopter variants of the Hip for civil airline use, which may make it an easier platform to obtain spare parts for than the military-only Hind attack helicopter.

No substantive claims have been made suggesting that helicopters sourced *directly* from Western suppliers are being used by the Syrian government to drop barrel bombs. Although Syria is known to possess about 30 French-manufactured Aérospatiale SA-342s (Gazelle),¹⁶ these are light utility helicopters and are not able to carry barrel bombs.

There is some evidence of other Western-made helicopters in use in Syria. Footage released in November 2012 claims to show US-made Bell UH-1 Iroquois ('Huey') helicopters flying over Syria.¹⁷ If verified, this would suggest that a number of helicopters in use by the Syrian military may have come from Iran, as Iran has a UH-1 derivative, the Bell 214, in its inventory, and is the only country willing and able to supply medium-lift Western helicopters to Syria. It should be noted that such helicopters will be at least 35 years old, as they were delivered to the Shah's regime prior to the 1979 Iranian revolution. However, there have been no reports of these platforms being used to drop barrel bombs.

Taking the above factors into account, it is unlikely that targeting helicopter manufacturers or spare-part suppliers will be an effective advocacy strategy for international non-governmental organisations wishing to put pressure on the Syrian government to end its use of barrel bombs.

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¹⁶ <http://www.globalsecurity.org/military/world/syria/airforce-equipment.htm>

¹⁷ <http://www.youtube.com/watch?v=odNSJYM6ubA> and <http://www.youtube.com/watch?v=A7ksHEzeZ2k>.