



SUPPRESSION OF ENEMY AIR DEFENCES – A PRIMARY MISSION

The modern battlefield bristles with extremely sophisticated and varied air defence systems. Today there is a proliferation of technologically advanced yet inexpensive air defence weapons. These have added to the threat to airborne assets, and contribute to making the battlefield an extremely dangerous place. The tactical situation is such that the Suppression of Enemy Air Defences (SEAD) is ever more critical to the achievement of air superiority, delineated in time and space. The basic aim of SEAD operations is to disrupt, disable and/or destroy enemy air defence networks to an extent wherein they are made incapable of effective interference in one's own air activity.

Complicating things further, some air defence systems are man-portable and have passive seekers, such as the shoulder-launched surface-to-air missiles (SAMs). Countering these is problematic, and they are worthy of a separate study. They are not the focus of this *Pathfinder*, which is the larger, more sophisticated and more capable air defence systems.

The initial concept of SEAD as an independent and critical role for air power was developed as purely a 'hard' kill option, ie. destruction options of enemy air defences by the use of anti-radiation missiles. However, over the years the role has assumed much greater sophistication. SEAD missions are now a combination of 'hard' and 'soft' kill operations optimally combined to achieve the required effect.

In the modern battlefield of networked forces, the soft kill option seeks primarily to disrupt or even control the sensors and communication links that provide a network with command facilities and decision-making capabilities. In the hard kill arena the aim is to destroy critical nodes within a network to disable the entire system. This is normally the air defence radar that is still central to area defence against air attacks.

Anti-radiation missiles therefore are still the preferred weapons for strike options. Since these missiles rely on

detecting radars that are emitting and then homing on to them, they are almost completely ineffective against targets that have shut down. There is considerable work in progress to ameliorate this situation by the use of active and passive radar homing devices in combination with inertial navigation and GPS. The effective use of GPS will require accurate intelligence regarding the geo-location of the target system. These modifications are not likely to be operationally available before 2008–09 and even then available only to a few air forces. An additional drawback is that even though the traditional missiles' inability to attack silent radars will be surmounted, it still needs external cueing to maximise its effectiveness.

The SEAD concept is dynamic and the demonstrated capabilities of Unmanned Aerial Vehicles (UAV) have provided new impetus for its further development. The UAV adds a hitherto unavailable characteristic to the entire concept—that of persistence. The longer endurance of UAVs, armed with missiles, makes the operation of air defence radars, even for short periods, extremely hazardous. A radar that cannot emit is obviously of very little use as an air defence weapon system.

Another facet of the concept is the use of airborne surveillance systems to tap into the available strike forces as soon as a radar or any other emitter has been tracked and identified. This obviously is dependent on free strike assets being available 'on call' with the appropriate weapon load and may not be an option that is always readily available.

The danger of the attacking aircraft being shot down makes SEAD a necessary but unsavoury (politically and tactically) mission. For this reason, there can be little doubt that future SEAD missions will almost completely be underpinned by Unmanned Combat Aerial Vehicles (UCAV) both in the hard and soft kill options. The inherent stealth of these vehicles will allow it to approach closer to the target system

and thereby the power required to jam its associated radars will be minimised. This development also points towards a UCAV being able to close-in to an air defence system sufficiently, before being threatened, to disrupt the system with a hard kill option with minimal collateral damage.

Undoubtedly, for a number of reasons, the future of SEAD resides in UCAVs. However, both the F-22 and the F-35 will field Active Electronically Scanned Array (AESA) airborne radar with electronic attack capability that in combination with the aircraft's stealthy profile will permit them to blind hostile radar in support of their own missions. It is envisaged that these aircraft will be able to create an electronically blind battlespace at will. At least for the conceivable future, the SEAD load will be distributed between a wide variety of platforms.



Harpy SEAD kamikaze UCAV by Israel Aircraft Industries

There is also significant research being undertaken to establish the capability of microwave energy weapons to 'burn out' computers and other electronics associated with air defence networks. There are claims that technology demonstrations have proved the viability of 'invading' computer networks and taking control of assets from their operators. At the moment

this may seem a far fetched idea, but in combination with other proven methods this may well be the elusive, fool-proof SEAD capability that can debilitate even the most sophisticated air defence network.

The concerted effort being put into developing these capabilities is a clear indication that SEAD will remain a core mission in the pursuit of air superiority, which in turn remains an absolute prerequisite for the success of all other missions. This certainty remains and is an imponderable, but the means of succeeding in the all-important SEAD mission are rapidly covering a very wide spectrum of assets. It may be that in the future there will be no specialised SEAD assets, but the force package within itself will be able to provide its own SEAD capabilities. The key elements in such a situation will include geo-location of the target system, real-time data flow between the elements of the package as well as within the designated battlespace and the availability of the expanded set of hard and soft kill options—all within the force package.

The maturation of the technologies that will provide non-lethal solutions to the conundrum of SEAD will take many more years, and therefore the primacy of the hard kill option is unlikely to be threatened in the foreseeable future. In whatever form, SEAD will remain the lifeline for all other missions.

"In air power's second century, ...[it] will face three emerging challenges, none of them in the air. They will be the new generations of mobile SAM, mobile surface-to-surface missiles and targets concealed in a civilian population."

– R.A. Mason, 'Air Power as a National Instrument: The Arab-Israeli Wars,' in Alan Stephens (ed.) *The War in the Air 1914-1994* (1994)



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