RADIUS®
RANGE ADAPTABLE DEVICE INCORPORATING UNIQUE SCALING

„the difference!“
First concepts of TDW’s Range Adaptable Device Incorporating Unique Scaling (RADIUS®) technology date back to the late 1990s. Development along with intensive testing, modeling and simulations began eventually in 2009 to offer a flexible solution which considers lessons learned from recent military engagements in Afghanistan, Iraq, Libya, operations against Islamic State and present budgetary constraints. It minimizes threats to friendly forces and reduces potential risks of collateral damages, especially in urban terrain. Since maximum outputs comparable to today’s systems are still available, the same weapon can also be used in high intensity military missions.
RADIUS® comprises a combined warhead and fuze technology that delivers three to five selectable output modes through one compact fuze system for scaled warhead effects between 10% and 100%. While some alternatives may reduce collateral damages, they do not offer operational flexibility during missions. With its unique way of managing layered detonative and subdetonative reactions of high explosives, the RADIUS® technology allows armed forces to select the desired military effect until the last second before target engagement. Output modes and appropriate endgames can be selected dependent upon target types, surrounding environments, and rules of engagement.

This will provide - for the first time - one weapon offering variable lethal and collateral damage areas. Such a new capability may allow armed forces to reduce their stock of weapon systems dedicated to specific target types and mission scenarios. This will help to reduce qualification and platform integration duration and costs, logistical constraints, and life cycle costs. RADIUS® technology belongs to the family of flexible response warheads developed by TDW, MBDA’s acknowledged competence center for warhead systems.

• Sole solution available offering a true operational flexibility
• Three to five selectable modes: from minimum to maximum effects
• Engagement of mission-planned targets and targets of opportunity
• Minimized risks of collateral damages and against friendly forces (Collateral Effective Radius - CER / Risk Estimated Distance - RED)
• Mission abort capability avoiding unexploded ordnances (UXOs) at minimum output
• Reduced platform integration efforts, logistical constraints and life cycle costs
• Affordable solution
**Applications**

TDW’s RADIUS® technology can be integrated into a broad variety of blast/fragmentation or penetrator warheads in a spectrum ranging from mini missiles with one kilogram of explosives to general purpose bombs with more than 100 kg of high explosives. Typical applications for each military service branch may include, but is not limited to:

- **Air Force:** precision guided bombs, deep strike missiles, air-to-ground missiles
- **Navy:** multi-role anti-ship missiles with land attack capability, long range cruise missiles
- **Army:** multi-role and indirect fire missiles, Guided Multiple-Launch Rocket System rockets, artillery projectiles

Besides dedicated development and qualification programs to implement the technology into new weapon systems, TDW can also offer adaptation developments for existing weapons. Through our unique design and simulation capabilities, novel concepts and lethal packages can be tailored to customer’s needs in short time frames of a few months followed by prototype tests at our proving ground.

**Tests demonstrated the technical maturity and novel capabilities**

Since 2009, RADIUS® technology has been tested more than 100 times. The first full-scale campaign carried out at Meppen proving ground WTD 91 in June 2013 demonstrated the baseline scalable warhead technology using approximately 90 kg of explosive in a static MK-82 general purpose bomb. The reduction potential of tested warheads was comparable to the effect of 10 kg of high explosive and it also proved the reliability of this novel minimum output mode. Such a scalable warhead can effectively engage military targets, while at the same time it minimizes damages to nearby civilians, vehicles, and buildings.

During the Scalable Effects Day at the United Kingdom MoD’s Otterburn Test Range on 21 October 2015, an enhanced version of the RADIUS® technology integrated into two MK-82 bombs was demonstrated. Both prototypes were completely identical and contained the same amount of high explosives. Two separate static firings were conducted, one at minimum (10%) output and a second at maximum (100%) output selected by the visiting audience. This allowed a comparison of effects against a representative target set. A SUV car target located at medium distance to the demonstrator presented significant differences. They ranged between a basically intact car showing no fragment perforations and a few window detachments at 10% mode to a high degree of impacts, perforations, and internal damages including the engine compartment at 100% output mode. These firings were witnessed by an international audience with more than 70 attendees.
Characteristics

- Mature technology
- Easy-to-integrate into weapon systems and platforms using existing physical and aerodynamic properties and standard interfaces (MIL-STD 1760)
- Output mode selection in the cockpit or through data link up to the last second
- IM compliant through iPBX and specific design measures
- Environmental temperatures proven
- Unburnt high explosive at minimum output reduced to <1%
- Compact modular dual output inline fuze system (e.g., 3" pocket)
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