27 November 2006

-ACE R&D LABS-

REALISTIC TACTICAL SIMULATOR (RTS)

A New Evolution in RC Tank Warfare

The RTS (Realistic Tactical Simulator) is a hull-mounted, infra-red combat system utilized during RC tank combat. This system is designed as a replacement for the inferior TBS receiver (commonly called 'Apple'), as the RTS vastly improves both RC tank combat and orients the AFV to its inherent strengths and weaknesses which have been inverted with the TBS 'Apple'.

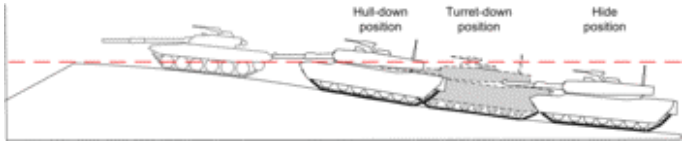
The RTS project, led by Nat McDonough of ACE's Research and Development Team, with the invaluable assistance of Jake Jacobs and Willy Loewer, have designed a battle system with the idea of replacing 'TBU warfare' with 'armor warfare'. The RTS has moved the target aspect of the AFV down from a single point over the vehicle down to the four sides of the hull, as well as also being able to simulate the armor thicknesses and angles of deflection found upon the typical four sides of any AFV. It is 100% compatible with the existing Tamiya electronics (DMD and MF unit), and simply replaces the 'Apple' receiver as a 'plug and play' module. Each of the four hull-mounted IR detectors is paired with its own LED. This allows for visual confirmation to the operator of not only 'hits', but also 'near misses' and from what side the vehicle was fired upon. Additionally, those used to combating with the TBU 'Apple' will now have to be much more precise with aiming, as the RTS demands more accurate aiming requirements.

With this 'directional detection' tankers utilizing the RTS will know 'where the shot came from' as only the detector which received the emission will light up. With any incomplete IR emission, the LED's on the RTS will flicker or glow- allowing the operator of both receiving and attacking AFV's to not only reveal who is shooting at them and from where, but if their shot was also 'a near miss' or 'off the mark'. Any registered hit will cause the IRD/ LED pair that has been struck with a complete emission to glow a solid red- in unison with the sound of emitted explosion from the MF unit. Each hull-mounted IRD has an adjustable aperture, designed to restrict the angle of IR reception-thus simulating the differences of armored thicknesses and angles found on the typical AFV hull. Examples: The IRD mounted on the sloped frontal armor of an AFV has the smallest aperture- and requires a 'dead-on' shot in order to register a hit at any distance greater than 20 feet; IRDs on the sides of the hull present less of an angle for a registered hit– simulating the thinner armor typically found there – as does the rear IRD. Being hull-mounted, the RTS is unaffected by turret rotation that changes the value of armor like with the TBU 'Apple'.

Now as the aspect of the relationship of the hull to the targeting tank changes the value of the armor line in the 'real world'. To register a hit, one must aim for the tank – and not a 'stove-pipe' type of device suspended above the turret.

Enhanced Striking and Defensive Postures

The configuration and reception differences are only what the RTS provides at face value. The nature of combating with the RTS is very different and more in-line with real AFV targeting and defensive postures than with 'TBU-Combat'. For example, the RTS in a defensive posture allows one of tank combat's most sought after tactical positions- the 'hull-down' fighting position. The 'hull-down' position when properly executed allows one to engage their opponent while only revealing their turret. This maneuver can be successfully simulated by positioning a tank behind a wall, berm, debris, etc, on any battlefield. In this position, one can achieve a degree of invulnerability of a defensive position while at the same time 'sending a little hurt' at the enemy. This means that a defensive position has much more impact than as a 'field of fire' is obtained and maintained, while at the same time being at a high degree of protection. In the offense, the RTS has also greatly improved this aspect, as it has oriented the AFV correctly regarding its strengths and weaknesses. In 'TBU-Combat', an AFV moves forward with the hull at 0-degrees relative to the enemy AFV while its Apple-configured turret is at a 45 degree angle to the hull. This is an inverse offensive posture to what is found in the real world with AFV's. In the real world, AFV's would only present the thickest portions of their vehicle to the enemy and at an angle in order to increase its overall armor thickness, hence the hull would be moving at 45-degree angle and the turret would be pointing at the enemy to shoot. This is what the RTS provides.



(The defensive postures of a tank including the hull-down position.)

In a Nutshell

The goal of the RTS is quite simple: To have a more realistic means of R/C tank combat than what the TBS 'Apple' currently allows. The RTS encourages realistic AFV tactics, strategies, and applications – not ones derived from the TBS 'Apple'. The prototype has been thoroughly tested, both indoors and out, and has the same operating ranges as the existing TBS 'Apple'.

The RTS requires no modification further for a vehicle that had a TBU 'Apple' to mount, no altering of the existing electronics, and can be used as a simple 'plug and play' device. Some of the aspects the RTS provides:

1) 100% compatibility with Tamiya electronics
2) 'Plug and Play' installation
3) No further modifications to a vehicle to mount
4) Replaces 'TBU warfare' with 'armor warfare'
5) Accounts for different armor thicknesses and angles
6) Allows 'Directional Detection'-the ability to visually track the impact
7) Allows tankers to see near misses and deflections
8) Encourages and allows for better offensive and defensive AFV postures such as the 'Hull-Down' fighting position
9) AFV is not affected or manipulated by turret direction
10) Maintains better constant armor values

RTS Performance Specifications as tested

Angle of shot required to register a hit
Frontal Plate Detector: 0-8 degrees from beyond 20 feet
Side Hull Detectors: 0-27 degrees from beyond 20 feet
Rear Hull Detector: 0-27 degrees from beyond 20 feet
Between 10 and 20 feet, the degrees double.
Inside 10 feet – all shots fired at tank, from all angles, registered hits with few exceptions.

Maximum Detection Ranges

Indoors
Frontal Plate Detector: 100 feet
Side Hull Detectors: 100 feet
Rear Hull Detector: 100 feet

Outdoors (full sunshine)
Frontal Plate Detector: 85 feet
Side Hull Detectors: 90 feet
Rear Hull Detector: 90 feet

'Near Misses and Deflections explained'

Every shot fired by the emitter is actually a 20 bit coded pulse; the same kind of transmission any typical TV remote would use. All the bits must be received and demodulated (read) to receive a 'hit'. Anything less than full reception of the data stream will result in a 'near miss' or 'deflection'. This is the case with the TBS 'Apple' as well, only you aren't aware of it, as the TBS 'Apple' is not designed to show us these incomplete emission receptions.

The RTS IRD's are designed to illuminate with any amount of data received, even incomplete emissions. The more bits that are received, the greater the glow of the LED's mounted in tandem with each IR detector. A greater number of bits, very close to the full amount necessary for registering a hit, will cause the LED's to glow a solid red, which looks very similar to a hit, but the absence of the explosion sound will tell the tanker that he has been fired upon – but not hit. As the number of received bits decreases, so does the glow of the LED's which gauges for the user just how close the shot was. Reception of only a few of the required bits will only cause the LED's to flicker. The apertures used on the IRD's make aiming a necessity, more so as the range to target increases. During outdoor testing for example, Jake had to lay prone behind his Tiger I, and 'aim' down the barrel as you would with a fire arm, to get a 'hit' at a range of 85 feet. Prior to doing this, he was only registering "near misses". In contrast, with the TBS 'Apple', all you had to do was be in the ball park with the shot.

Mounting the RTS

Each tank model is shaped differently, so each tank will need its own standardized mounting hardware. Jake is currently designing the mounting hardware for each tank model in such a way, that the RTS will have a standardized mounting, and not a customized mounting. We realize the confusion and controversy which would take place without such mounting solutions in place. We don't need people arguing and debating over where the IRD's should be mounted – how high, how low, etc. This would only lead to bickering and tampering. Each tank will have a mounting solution that allows it to interact with all other tanks on a level playing field. Why it is possible to adjust apertures with respect to historical specs (making the apertures smaller for thicker armored vehicles) – we don't want to encourage everyone to abandon the "thinner skinned" vehicles. With this in mind, the RTS will be made the same way, for every tank model. This is in the spirit of 'fun first', and will not penalize 'light class' tanks or 'mediums. We enjoy seeing the wide range of models on the battlefield, so the RTS will not penalize any class. Again, for those desiring an even greater degree of accuracy, the apertures can always be modified to simulate the virtually impregnable armor found on some vehicles, but the RTS 'straight out of the box' will be uniform in its design. We will leave the modifications to those who want to go in that direction.

Breaking New Ground

The RTS is not perfect, as no IR combat module can replicate real armor combat, nor is that a desired option as the RC tanks are not cheap. However, the RTS is a vast improvement over the TBS 'Apple' in all respects and encourages proper AFV offensive and defensive dynamics. I had considered integrating a Basic Stamp II with the RTS, but simply couldn't figure out a way to keep the costs down to a reasonable amount, as the chips alone will run you around $50 – and this is before any components are added. I also explored the possibility of integrating the DIY Miles hardware, but the board was WAY too big to be practical – the support for the hardware non-existent, and with no guarantees that it could be integrated with the Tamiya Electronics, decided it was not a viable option.

When I began this project, there were three parameters I was asked to meet: 1) Keep it cheap 2) Hull Mounted – to grant a "hull down" position and simulate realistic armor values 3) Make it "plug and play" and 100% compatible with the existing Tamiya Electronics – and the RTS meets these parameters. The RTS may not be for everyone, as some have mastered and worship the 'Art of the Apple'. ACE is more interested in the 'Art of Armored Warfare' than in manipulating the strengths and weaknesses of a vastly inferior TBS 'Apple', a system which utilizes a target positioned above the vehicle waiting to take a hit when you can't even sometimes see the vehicle.

Regards, Nat

All testing was performed by Jake and Nat on November 25, 2006. All ranges verified by Hilti-Laser Range Finder. All angles and degrees verified with common angle compass, similar to Speed Square, used in building industry.

RTS TEAM

Nat McDonough: Engineering, Design and Production
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Willy Loewer: Inspiration