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**Teleprompter Script for Dr. Deepak Varshneya, Program Manager,  
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Empowering the Guy on the Ground

» **DEEPAK VARSHNEYA:**

When I arrived at DARPA a year ago, I saw an enemy propaganda video that showed their **snipers** taking shots at our troops patrolling urban areas.

Clearly, their agenda was to strategically sap our morale and degrade our staying power in this war.

The videos are too disturbing to show,  
but believe me;  
watching them would make your blood boil.

You would yearn to  
turn the tables.

You would want to transform the hunters into the hunted.

This is exactly my agenda at DARPA.

Hello my name is Deepak Varshneya and my goal is to **empower the soldiers on the ground**.

I draw upon **25 years** of industry experience to provide **new tactical capabilities** to our troops.

Capabilities that will **protect them from enemies** while providing **greater lethality at longer standoff ranges**.

My agenda is to **save the lives** of our men and women in uniform and of innocent civilians that may be the victims in a combat environment.

If you watch the enemy propaganda video, it reveals how tough it is to be a soldier on the ground.

**Just imagine** if **you** were patrolling the urban areas providing safety to the people while looking for the enemy in hiding.

These tasks are **hard**, but **harder yet** when you consider that you might be in the **crosshairs of an enemy sniper**.

This would affect **anybody's** concentration and their mission.

Can we protect our soldiers from getting shot in this way??

Can we free them from this threat so they can accomplish their missions??

**Yes, we can.**

But **only** if we can detect and neutralize these snipers,

**“left of the boom,”** --

that is, **before** the shot is fired... something General Amos identified Tuesday as one of his troops' greatest needs.

I took this problem to heart looking for a solution.

I embarked on a new program called C-Sniper – for **“see the sniper.”**

I wanted DARPA's C-Sniper system to detect enemy snipers left of the boom, **hiding anywhere**, regardless of whether they are aided by riflescopes or have their eyeballs behind iron sights.

Finding things 24/7, under all conditions, is a challenge but the real challenge is in finding things **fast** in the presence of **clutter**.

The solution **clearly requires** innovation at every turn.

Utilizing principles of **optical augmentation, polarization retention, and time / spatial discrimination**, we **can** eliminate clutter, and correctly **identify** and **locate** targets **rapidly**.

The latest **electro-optical technologies** such as high-density focal plane arrays, MEMS steering mirrors, DMD optical switches, high-sensitivity detectors, and high power lasers enable the rejection of clutter while enhancing the signal.

A system employing such devices is being developed which, if successful, will operate from military vehicles, providing surveillance and identification of enemy snipers in 360 degrees azimuth x 45 degrees elevation... 24/7.

One of the goals of the program is to provide a **protection circle** around vehicles,

allowing our soldiers to conduct their duties with **high confidence**.

C-Sniper will be integrated with DARPA's Crosshairs program which detects and locates post boom munition firings.

The integrated system will provide end-to-end coverage; sense **pre-** and **post-boom** shots with **high accuracy**, and **neutralize targets quickly**.

Bottom line:

DARPA's C-Sniper program will **get** the bad guys before they can get us.

We will soon make the first contract awards for the demonstration of its feasibility.

Although C-Sniper will satisfy the near term objectives, new ideas are required for certain longer term objectives.

For example, doubling the detection range and the protection circle, while reducing engagement time to half will further enhance system performance.

But how about the problem of maximizing **our** snipers' lethality under **crosswind conditions??**

The **best** way to achieve this is to ensure our sniper **drops his target with the first shot**.

To understand this problem,  
I went **right** to the source:  
a sniper training school  
in Camp Pendleton, California.

The Marines at the school — some just returned from Iraq — showed me how **easy it was to miss a shot** with just a couple of miles per hour of crosswind.

Wind is transparent and gusts are virtually impossible to time and estimate.

Even a light gust has a **huge** impact on the hit-position, and missing the target by over **1.5 meters** at distances as short as **400 meters** is **not** uncommon.

**That** experience led me to the creation of the **One Shot program**.

DARPA's One Shot will allow our Snipers to **deliver accurate shots** under crosswind conditions gusting to over 40 mph, **up to** the effective ranges of weapons.

The idea in One Shot is to employ **novel** laser concepts that **measure** the three-dimensional flow of atmospheric eddies **in a blink of an eye**.

One Shot will not **only** measure three dimensional wind, but also **profile it downrange**, enabling **much higher** hit accuracies.

The objectives are to remove windage and range errors, and provide the shooter with a continuously updated ballistic solution and a corrected aim point.

If the program is successful,  
**the shot will not miss** due to crosswinds.

One Shot will **dramatically reduce** sniper training and qualification time.

But, could One Shot benefit further from your innovative thoughts and ideas??

Definitely.

I welcome those ideas.

Now, what can we do to support our forward observer and designator teams so **they** are out of harms way??

In turbulent environments at standoff ranges longer than a couple of kilometers, it is **hard to see and ID targets let alone designate them.**

You can see **something** — but is it a **tank**, a **truck**, or a **bus packed with people??**

The target image **dances** and the designating beam **breaks up** before it reaches the target.

How can we ID and designate targets at **twice** today's ranges and do it at **half** the cost under adverse environments??

We explored answers to these issues in DARPA's High Precision Laser Designator (HPLD) program.

**Despite high atmospheric turbulence, crisp** target images were generated **while the designating beam breakup and wander were**

**reduced in  
near real time.**

We accomplished these using high frame-rate shortwave IR cameras, fast steering optical elements, high beam quality lasers, and state of the art processors that crunched data at **blazing** speeds.

Will these programs I described be enough to **stop** the enemy??

**No.**

**We must do more.**

**C-Sniper, One Shot,**  
and **HPLD** are just the beginning.

So I ask for **your** help, **your innovative thoughts** and **clever ideas** that could **empower** our soldiers on the ground.

We would like to explore how we can improve target azimuthal accuracy by **ten times** so targets could be neutralized with a single GPS guided drop??

Magnetic compasses are inaccurate and their calibration changes due to presence of flak jackets and weapons.

Low drift inertial gyro systems are too large and expensive.

Does the solution reside at the system rather than at component level??

Recently, carrier phase tracking GPS technology has shown that absolute GPS coordinates can be determined to mm accuracy in a

**fraction** of time.

Is it possible to use a set of GPS receivers configured in a short baseline to estimate target location??

But what about GPS denied areas??

Clearly, the problem is complex and requires clever solutions.

Another problem we are investigating is to combine three sights into one for the infantry.

This universal sight must weigh **one third** the combined weight of the three and can **see** through **battlefield and environmental obscurations ...**  
**day or night**??

**Why is this important??**

Well, General Amos told us **because** our soldiers could then carry only one universal sight and immediately **lose 8 pounds** off their backs.

Oh, what a relief!!

The universal sight could also benefit from **electro-optic zooming** so shooters could maintain aim on target during identification.

Can this be done?

Yes it can be.

For example recent technology developments in the area of flexible membranes and adaptable polymers show that lenses could be made

that change focal length on demand by exposing the polymers to ultraviolet radiation, compressing them or changing membrane shape using micro pumps?

Both Dr. Tether and General Amos talked about the WASP program; the Guardian Angel of the troops in Iraq.

Situational awareness was provided via airborne cameras when there was no direct line of sight to the target.

**But** can we also use short range micro UAVs **to neutralize** Non Line Of Sight targets remotely??

We can, only if we could **reduce** the weight of laser designators and beam directors by **100 times**.

Short range designation from micro UAVs could provide surgical strikes against Non Line Of Sight targets, **something** that is not possible today.

We also want to remotely identify vehicles carrying **IED's** and **suicide bombers** without disrupting the traffic flow.

We want to remotely detect and image explosives **in vehicles** rapidly, and **stop them** non-lethally.

Can differential IR absorption, photo thermal interferometry, LIBS, x-ray imaging or high spectral power microwaves or other technologies help in achieving these goals??

Any good ideas, folks??

Can we extend the **same level of protection** to

**maritime traffic** so that we can **protect** our Navy ships from future **Cole-like attacks**?

We want to discern enemy small rafts and speedboats from **harmless** fishermen.

Radars, if they can detect the target, provide a point on the screen, which is a good start, but cannot ID targets under even normal conditions, leave aside fog or rain.

Can we stop them non-lethally or **neutralize** them if they present a threat when we ID them??

Your ideas are welcome.

All these are **tall orders**.

But so is the mission that we ask **our young soldiers** to carry out.

I **firmly** believe innovations in electro-optical sensors and systems will **break new ground** in enhancing our tactical and operational capabilities.

This **would** redefine the “impossible envelope”.

With **your** help, DARPA **can** achieve these goals.

**Together** we can **change** the outcome of those propaganda videos.

We can **save** the **precious** lives of our troops and the many that support our noble cause for peace and freedom.

We are **determined** to find answers and will **continue to empower** our soldiers on the battleground.

Thank you.

Next, my colleague,  
Khine Latt, will delve more deeply into countering the maritime  
challenges  
I just touched on.