

## **USE OF DRONE RADAR IN WORK ZONES**

### **A. INTRODUCTION**

Drone radar<sup>1</sup> is a small, lightweight, weatherproof electronic device that emits radio signals that activate radar detectors used by the general public. Police radar/presence is known to have an effect on the speed of drivers. Vehicles equipped with radar detectors perceive the transmitted radar signals from the drone<sup>2</sup> as the presence of police enforcement in the area. The basic premise is that motorists believing there is a police car nearby will reduce their speeds due to the perceived increased risk of receiving a speeding citation (i.e., mimicking enforcement).

### **B. OBJECTIVE**

- To alleviate some of the speeding problems in work zones.
- Radar drones are intended to slow those vehicles equipped with radar detectors (it is assumed that drivers with radar detectors typically drive faster than the mean).

### **C. LITERATURE REVIEW SUMMARY**

#### **C.1. ADVANTAGES**

- Drone radar is very effective in reducing the number of vehicles traveling at excessive speeds (i.e., 10 mph or more over the speed limit). The proportion of excessive speeders is reduced by 6 to 33 percent (see 2, 8, 9, 12, 14, 16 and 20).

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<sup>1</sup> Also referred as to passive or unmanned radar.

<sup>2</sup> Radar signals are sent on the K band, which is the band most used by police.

- The stimulus received from the chirp of the radar detector has the benefit of alerting sleepy, fatigued and inattentive drivers, resulting in increased drivers' awareness and attention while traveling through the work zone.
- Drone radar has been found to reduce mean traffic speed by 0 to 4 mph (see 5, 8, 9, 12, 16 and 20).
- Drone radar is a low cost easy to implement speed reduction countermeasure.
- Drone radar has a greater effect on the mean speed of large trucks.

## **C.2. DISADVANTAGES**

- Radar transmissions do not present a speed reducing stimulus to each driver approaching a work zone. Drone radar only targets motorists with radar detectors.
- Traffic speeds are reduced near the location of the drone radar, but about one mile after exposure the traffic speeds return to normal.
- Drone radar alone does not reduce traffic speeds to the desired level.
- Use of drone radar for a long time may reduce its effectiveness since drivers may come to understand that the radar emissions are not coming from a law enforcement unit.
- Texas reported that vehicle conflicts (e.g., severe braking, last minute lane changing) were increased when the radar signal was transmitted.

## **C.3. OTHER RELEVANT ISSUES**

- Drone Radar units range in price from \$400.00 to \$600.00.
- Radar detector use is more prevalent among trucks and among high-speed drivers.
- Kentucky reported that 42 percent of trucks and 11 percent of passenger cars traveling on a heavily traveled Interstate highway were equipped with radar detectors.
- Unofficial estimates for 1997 from the Virginia State Police indicated that 15 to 25 percent of vehicles traveling on I-81 use radar detectors.
- Michigan reported that about 5 percent of cars and 16 percent of trucks use radar detectors.



- Radar detector usage is presumably higher on Interstate highways.
- Truck drivers communicate with each other over Citizen's Band radio when a radar transmission has been detected.
- High-speed drivers are more prone to have a radar detector unit attached to their vehicles.
- In a study conducted in Texas, most drivers reported that drone radar positively influenced their driver behavior.
- South Dakota reported that the number of crashes involving maintenance vehicles was decreased after deployment of drone radar.
- New York and Kentucky reported successful use of drone radar for slow moving vehicle operations (e.g. mowing, sweeping).
- Ohio reported that drone radar caused speed reductions particularly at night.
- Some studies reported that speed variability was increased when radar was activated.

#### **D. DEPLOYMENT GUIDELINES**

- Drone radar should be used in work zones where excessively speeding vehicles are a problem; most particularly where speeding tractor trailers are a problem.
- Drone radar may be used either on urban or rural high-speed facilities.
- Drone radar may be used in both short- and long-term work zone operations. However, its use is particularly recommended for short duration operations (i.e., up to three days)."
- Drone radar should be used for slow moving maintenance operations (e.g., mowing and sweeping). The radar should be mounted on the maintenance vehicle. There is evidence indicating that drone radar is very effective to improve the safety of slow moving operations.
- Drone radar should be placed where a speed reduction is desired (e.g., beginning of a lane closure taper, flagger location), emitting a signal 1,500 to 2,000 ft upstream of the work zone.
- In stationary work zones, drone radar should be placed in a location that provides the maximum threat of police presence.
- Drone radar may be mounted on a variety of objects, including (but not limited to) guardrails, signs, sign posts, arrow panels, barrels, flagger or maintenance vehicles.



- If possible, two drone radar units should be deployed simultaneously in the work zone. This will increase the radar effectiveness by making it difficult for drivers to determine the source of the transmission.
- Special care must be taken to conceal the drone radar units from the view of passing motorists.
- Drone radar locations and hours of operation should be periodically varied to maximize its effectiveness.
- Periodic police enforcement in conjunction with drone radar should be used to maintain the effectiveness of the drone in long-term applications.

## Disclaimer

The information provided in this section of the Maryland State Highway Administration's Work Zone Safety Tool Box is only to provide guidance. The Work Zone Safety Tool Box supplements current practices and standards provided in the current edition of the following documents:

- 1) The Manual on Uniform Traffic Control Devices (MUTCD)
- 2) The Maryland Supplement to the Manual on Uniform Traffic Control Devices
- 3) Maryland State Highway Administration Standard Sign Book
- 4) Maryland State Highway Administration Book of Standards for Highway and Incidental Structures
- 5) Maryland Department of Transportation State Highway Administration Standard Specifications for Construction and Materials

## E. REFERENCES

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## Drone Radar Summary of State DOT Surveys

1. Has your agency ever used Drone Radar in work zones? (Yes/No)
2. What was/is the perceived effectiveness of the Drone Radar as a speed control measure? (Extremely effective/ Very effective/Somewhat effective/Not very effective/Not at all effective)
3. Please mention any problem/disadvantage associated with the use of drone radar in work zones.
4. In what type of environment has the Drone Radar been used? (Urban/Rural/Both)
5. In what type of work zone has the Drone Radar been used? (Stationary construction zones/Maintenance zones/Mobile operations/All of the above)
6. Has your agency written a report, conducted research or field-trials on the effectiveness of the Drone Radar as a speed control measure? (Yes/ No)
7. Does your agency have an established policy /guidelines on the use of Drone Radar? If yes, please describe it.
8. Do you have any other comments/suggestions about the use of Drone Radar in work zones?

States Responded	Answers to Questions								Contact	Phone	
	1	2	3	4	5	6	7	8			
Arizona	No	-	-	-	-	-	-	-	-	Michael Manthey	(602) 255-8888
California	Yes	Effective	None	Both	All	-	-	Drone radar and radar speed advisory devices are an effective method of reducing speeds through work zones in areas where the use of radar detectors is prevalent; i.e.; interstate highways, trucking corridors, etc.	Linda M. Simpson	(916) 654-6072	
Connecticut	No	-	-	-	-	-	-	-	Terri L. Thompson	(860) 594-2667	
Delaware	No	-	-	-	-	-	-	-	Michael S. Hitchens	(302) 326-4494	
Idaho	No	-	-	-	-	-	-	-	Lance Z. Johnson	(208) 334-8557	
Illinois	Yes	Somewhat Effective	Did not take drivers long to realize that no police were present and they returned to speeding	Both	Short Term Maintenance Zone	No	No, but they allow maintenance crews to use them if they feel they are effective in their area.	-	James Schoenherr	(217) 782-3450	
Kansas	Yes	Very Effective	-	Urban	Stationary Construction	No	No	-	George Stelzmler	(701) 328-2556	
Kentucky	No	-	-	-	-	-	-	-	Jeffery Wolfe	(502) 564-3020	
Michigan	No	-	-	-	-	-	-	-	Jeffery K. Grossklaus	(517) 322-5769	
Nevada	No	-	-	-	-	-	-	-	Mark Mindrum	(775) 888-7555	
New York	Yes	Effective in some locations but generally it has not been effective in reducing speeds	Drivers who travel the route routinely quickly figure out that there is no actual police enforcement and they ignore the signal.	Rural	Stationary Construction	-	-	It only affects drivers who have radar detectors	Charles Riedel	(518) 457-2185	
Ohio	No	-	-	-	-	-	-	-	Mack Braxton	(614) 752-8829	
Rhode Island	No	-	-	-	-	-	-	-	Frank Corrao	(401) 222-2694	
Tennessee	No	-	-	-	-	-	-	-	David C. Donoho	(615) 741-2414	
Vermont	No	-	-	-	-	-	-	-	John Perkins	(802) 828-2603	
Virginia	Yes	Not perceived to be very effective as a speed control measure	Project personnel had to keep the units charged and moved around on the project so motorists would not get used to the detectors going off at the same location without seeing a police presence.	Rural	Stationary Construction	Virginia Tech developed a report	No	16 Units were used statewide. Prior to their distribution and use, a meeting was held with the Virginia State Police and project personnel to coordinate the periodic presence of police on the project when the drones were in use so that motorists would not be sure when their detectors went off if police were there or not. Although radar detectors are illegal in Virginia, they realize that motorists from other states who have them don't disconnect them and place the unit in their trunks. The purpose of the deployment was to try to reduce the higher speeds of those who did use them while traveling through a highway construction zone. Overall speeds were reduced by 2 to 3 mph in the study that was conducted in one district.	David B. Rush	(804) 371-6672	
Wisconsin	Yes	Somewhat Effective	If drivers get accustomed to lack of actual enforcement at a location, the drone radar may tend to be ignored.	Rural	All	-	No	-	Thomas N. Notbohm	(608) 266-0982	
Wyoming	No	-	-	-	-	-	-	-	Mike Gostovich	(307) 777-4492	