USE OF DRONE RADAR IN WORK ZONES

A. INTRODUCTION

Drone radar\(^1\) 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\(^2\) 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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\(^1\) Also referred as to passive or unmanned radar.

\(^2\) 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


2. M.D. Fontaine, H.G. Hawkins, Jr. (2001). Catalog of Effective Treatments to Improve Driver and Worker Safety at Short-Term Work Zones. Product 1879-3, Texas Transportation Institute, College Station, TX.


WORK ZONE SAFETY TOOLBOX
## Drone Radar Summary of State DOT Surveys

<table>
<thead>
<tr>
<th>States Responded</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<td>Arizona</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Michael Manthey</td>
<td>(602) 255-8888</td>
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<tr>
<td>California</td>
<td>Yes</td>
<td>Effective</td>
<td>None</td>
<td>Both</td>
<td>All</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Linda M. Simpson</td>
<td>(916) 654-6072</td>
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<td>Connecticut</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Terri L. Thompson</td>
<td>(800) 584-2067</td>
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<tr>
<td>Delaware</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>Michael S. Hitchens</td>
<td>(302) 326-4494</td>
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<td>Idaho</td>
<td>No</td>
<td>-</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>Lance Z. Johnson</td>
<td>(208) 334-8557</td>
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<td>Illinois</td>
<td>Yes</td>
<td>Somewhat Effective</td>
<td>Did not take drivers long to realize that no police were present and they returned to speeding</td>
<td>Both</td>
<td>Short Term Maintenance Zone</td>
<td>No</td>
<td>No, but they allow maintenance crews to use them if they feel they are effective in their area.</td>
<td>-</td>
<td>James Schoenherr</td>
<td>(217) 782-3450</td>
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<tr>
<td>Kansas</td>
<td>Yes</td>
<td>Very Effective</td>
<td>-</td>
<td>Urbani Stationary Construction</td>
<td>No</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>George Statziller</td>
<td>(701) 329-2596</td>
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<td>-</td>
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<td>-</td>
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<td>Jeffery Wolfe</td>
<td>(502) 564-3020</td>
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<td>-</td>
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<td>Jeffery K. Grosskauss</td>
<td>(517) 322-5769</td>
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<td>Nevada</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>Mark Mindrum</td>
<td>(775) 888-7555</td>
</tr>
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<td>New York</td>
<td>Yes</td>
<td>Effective in some locations but generally it has not been effective in reducing speeds</td>
<td>Drivers who travel the route routinely quickly figure out that there is no actual police enforcement and they ignore the signal.</td>
<td>Rural</td>
<td>Stationary Construction</td>
<td>-</td>
<td>-</td>
<td>It only affects drivers who have radar detectors</td>
<td>Charles Riedel</td>
<td>(518) 457-2165</td>
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<td>Ohio</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Mark Braxton</td>
<td>(614) 762-8829</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Frank Corrao</td>
<td>(401) 222-2074</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>David C. Donoho</td>
<td>(615) 741-2414</td>
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<td>Vermont</td>
<td>No</td>
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<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>John Perkins</td>
<td>(802) 828-2603</td>
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<td>Virginia</td>
<td>Yes</td>
<td>Not perceived to be very effective as a speed control measure</td>
<td>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.</td>
<td>Rural</td>
<td>Stationary Construction</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>David B. Rush</td>
<td>(804) 371-6672</td>
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<tr>
<td>Wisconsin</td>
<td>Somewhat Effective</td>
<td>If drivers get accustomed to lack of actual enforcement at a location, the drone radar may tend to be ignored.</td>
<td>Rural</td>
<td>All</td>
<td>-</td>
<td>No</td>
<td>-</td>
<td>-</td>
<td>Thomas N. Nolbohm</td>
<td>(608) 266-0982</td>
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<tr>
<td>Wyoming</td>
<td>No</td>
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<td>-</td>
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<td>-</td>
<td>-</td>
<td>-</td>
<td>Mike Gostovich</td>
<td>(307) 777-4492</td>
</tr>
</tbody>
</table>

### Questions

1. **Has your agency ever used Drone Radar in work zones? (Yes/No)**
   - **Arizona**: No
   - **California**: Yes
   - **Connecticut**: No
   - **Delaware**: No
   - **Idaho**: No
   - **Illinois**: Yes
   - **Kansas**: Yes
   - **Kentucky**: No
   - **Michigan**: No
   - **Nevada**: No
   - **New York**: Yes
   - **Ohio**: No
   - **Rhode Island**: No
   - **Tennessee**: No
   - **Vermont**: No
   - **Virginia**: Yes
   - **Wisconsin**: Somewhat Effective
   - **Wyoming**: 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)**
   - **Arizona**: None
   - **California**: Both
   - **Connecticut**: None
   - **Delaware**: None
   - **Idaho**: None
   - **Illinois**: Did not take drivers long to realize that no police were present and they returned to speeding
   - **Kansas**: Urban Stationary Construction
   - **Kentucky**: None
   - **Michigan**: None
   - **Nevada**: None
   - **New York**: Rural Stationary Construction
   - **Ohio**: None
   - **Rhode Island**: None
   - **Tennessee**: None
   - **Vermont**: None
   - **Virginia**: Virginia Tech developed a report
   - **Wisconsin**: No
   - **Wyoming**: None

3. **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)**
   - **Arizona**: No
   - **California**: Yes
   - **Connecticut**: No
   - **Delaware**: No
   - **Idaho**: No
   - **Illinois**: No
   - **Kansas**: Yes
   - **Kentucky**: No
   - **Michigan**: No
   - **Nevada**: No
   - **New York**: No
   - **Ohio**: No
   - **Rhode Island**: No
   - **Tennessee**: No
   - **Vermont**: No
   - **Virginia**: Yes
   - **Wisconsin**: No
   - **Wyoming**: No

4. **In what type of environment has the Drone Radar been used? (Urban/Rural/Both)**
   - **Arizona**: Urban
   - **California**: Rural
   - **Connecticut**: Urban
   - **Delaware**: Rural
   - **Idaho**: Rural
   - **Illinois**: Both
   - **Kansas**: Both
   - **Kentucky**: Urban
   - **Michigan**: Urban
   - **Nevada**: Urban
   - **New York**: Both
   - **Ohio**: Urban
   - **Rhode Island**: Urban
   - **Tennessee**: Urban
   - **Vermont**: Urban
   - **Virginia**: Both
   - **Wisconsin**: Urban
   - **Wyoming**: Urban

5. **In what type of work zone has the Drone Radar been used? (Stationary construction zones/Maintenance zones/Mobile operations/All of the above)**
   - **Arizona**: Urban Stationary Construction
   - **California**: Both
   - **Connecticut**: Urban Stationary Construction
   - **Delaware**: Rural Stationary Construction
   - **Idaho**: Rural Stationary Construction
   - **Illinois**: Both
   - **Kansas**: Both
   - **Kentucky**: Both
   - **Michigan**: Both
   - **Nevada**: Both
   - **New York**: Both
   - **Ohio**: Both
   - **Rhode Island**: Both
   - **Tennessee**: Both
   - **Vermont**: Both
   - **Virginia**: Both
   - **Wisconsin**: Both
   - **Wyoming**: Both

6. **Has your agency an established policy/guidelines on the use of Drone Radar? If yes, please describe it.**
   - **Arizona**: None
   - **California**: No
   - **Connecticut**: None
   - **Delaware**: None
   - **Idaho**: None
   - **Illinois**: No
   - **Kansas**: Yes
   - **Kentucky**: No
   - **Michigan**: No
   - **Nevada**: No
   - **New York**: No
   - **Ohio**: No
   - **Rhode Island**: No
   - **Tennessee**: No
   - **Vermont**: No
   - **Virginia**: Yes
   - **Wisconsin**: No
   - **Wyoming**: No

7. **Does your agency have an established policy/guidelines on the use of Drone Radar? If yes, please describe it.**
   - **Arizona**: None
   - **California**: No
   - **Connecticut**: None
   - **Delaware**: None
   - **Idaho**: None
   - **Illinois**: No
   - **Kansas**: Yes
   - **Kentucky**: No
   - **Michigan**: No
   - **Nevada**: No
   - **New York**: No
   - **Ohio**: No
   - **Rhode Island**: No
   - **Tennessee**: No
   - **Vermont**: No
   - **Virginia**: Yes
   - **Wisconsin**: No
   - **Wyoming**: No

8. **Do you have any other comments/suggestions about the use of Drone Radar in work zones?**
   - **Arizona**: None
   - **California**: None
   - **Connecticut**: None
   - **Delaware**: None
   - **Idaho**: None
   - **Illinois**: None
   - **Kansas**: None
   - **Kentucky**: None
   - **Michigan**: None
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