

Seeker Airmag Speed Testing Results

Introduction

The performance of the Seeker Airmag was tested over a period of two days at the Delhi Aerodrome using the Bluestreak Protocol. The Seeker Airmag was designed for effective sweeping at higher speeds. The horseshoe design of the magnet yields an extremely high field in the 1"-3" sweeping range. Additionally, the magnet is 12" in the direction of travel to increase the time spent over the debris. These two factors increase the chances that difficult debris will be collected. Three modules of the Seeker Airmag can be connected for a sweeping width of 180", however, only one module was used in these tests.

Test Procedure

For each debris type and sweeping height a speed estimate was made and tested. From the results obtained, speed was reduced or increased to determine at which speeds the magnet would pick up 90% and 100% of the debris. The image below shows where debris clusters were positioned. Debris clusters outside the effective width of the sweeper are not considered.

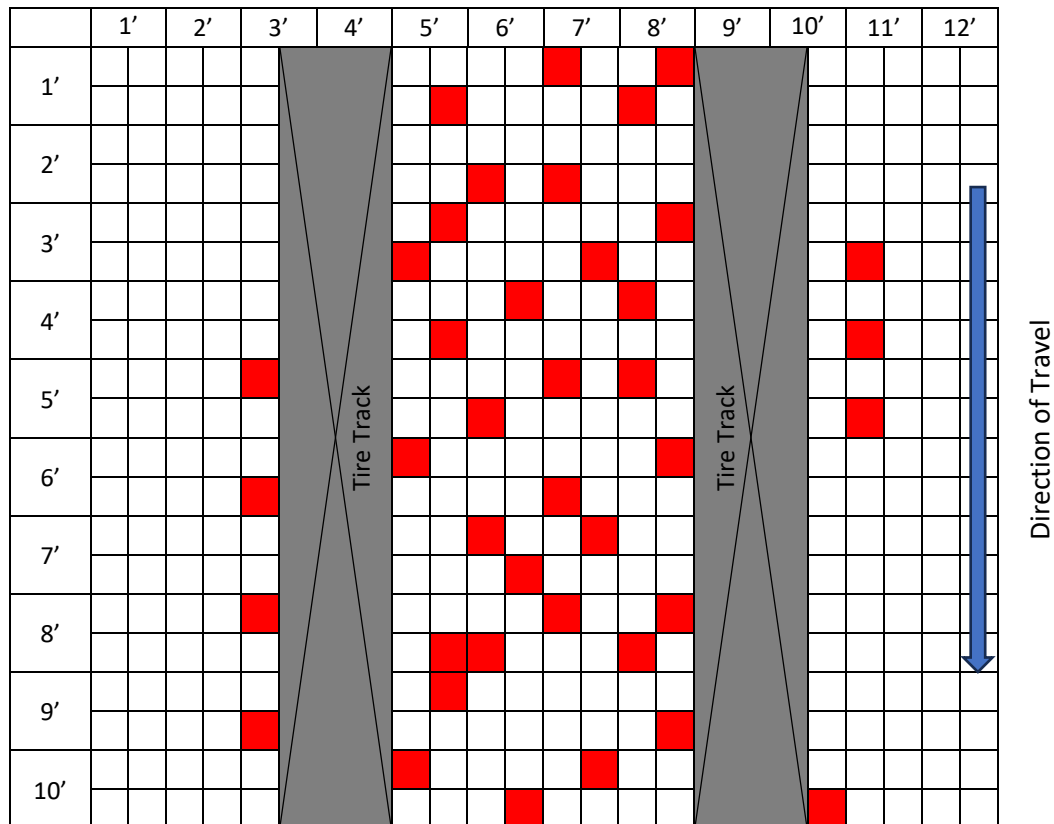


Table 1: Debris Layout - 12' x 10' grid with 6" squares

Debris Type	Number of Each
Bolts (1/2-13 x 3" hex bolts)	1
Nuts (1/2-13)	5

Wire Scraps (approximately 7")	2
Ball Bearings (3/16" - 3/4")	5

Table 2: Debris Description

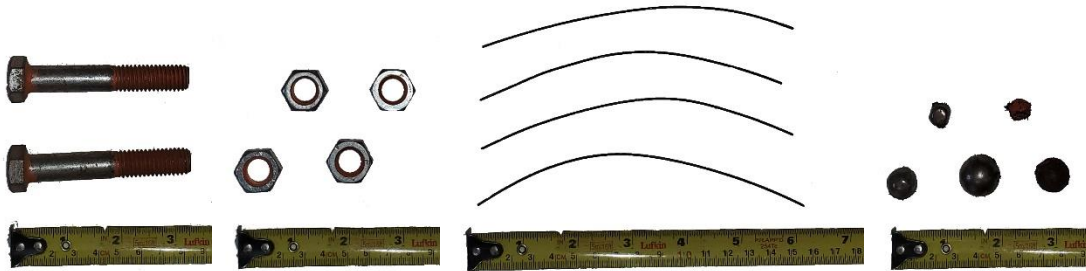


Figure 1: Test Debris (Bolts, Nuts, Wire Scraps, Ball Bearings)



Figure 2: Test process depicted using Piranha 96 Sweeper

Test Results

Magnet Characterization

Magnetic Field Measurements

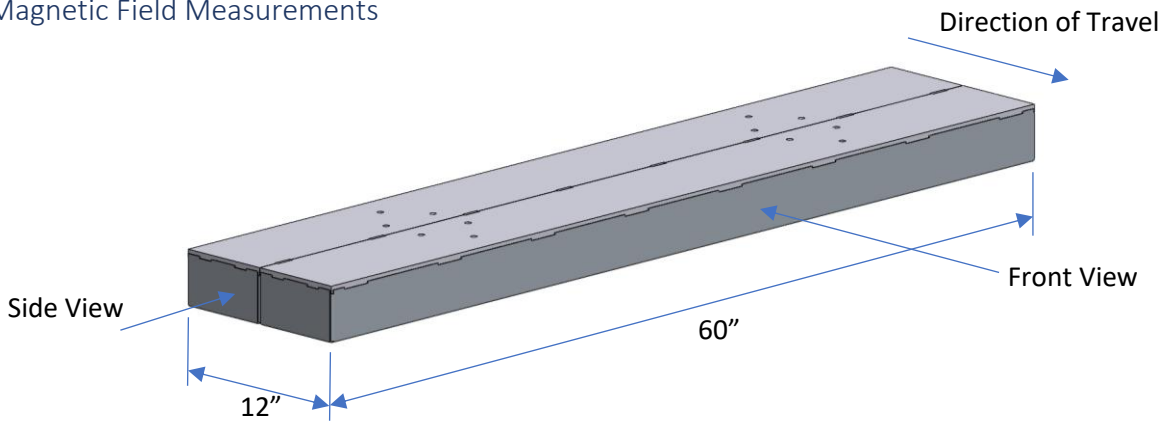


Figure 3: Magnet View Description

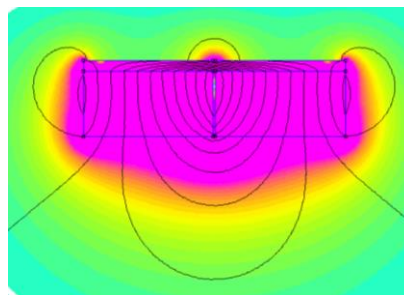


Figure 4: Field Simulation Side View

		Simulated B at x from Surface (G)			Measured B at x from Surface (G)		
		1	2	3	1	2	3
Distance from Centre (inches)	-6	835	542	392	873	525	406
	-4	1023	730	527	1008	726	512
	-2	1258	891	633	1191	931	597
	0	1648	1013	691	1609	1007	685
	2	1258	891	633	1287	817	652
	4	1023	730	527	994	704	522
	6	835	542	392	767	558	371
Average		1125	762	542	1104	752	535

Table 3: Simulated vs Measured Gauss (Side View)

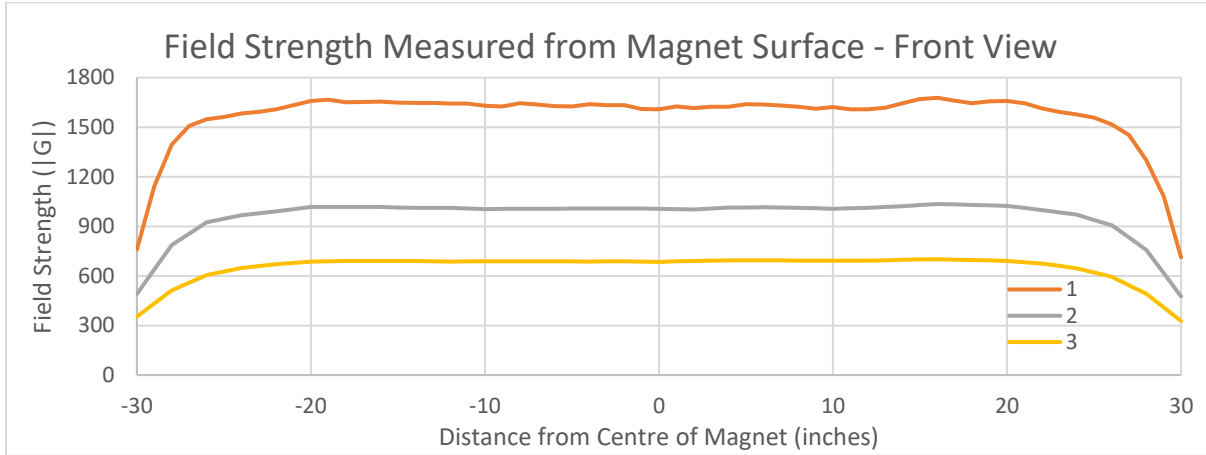


Figure 5: Field Strength Measured from Magnet Surface - Front View

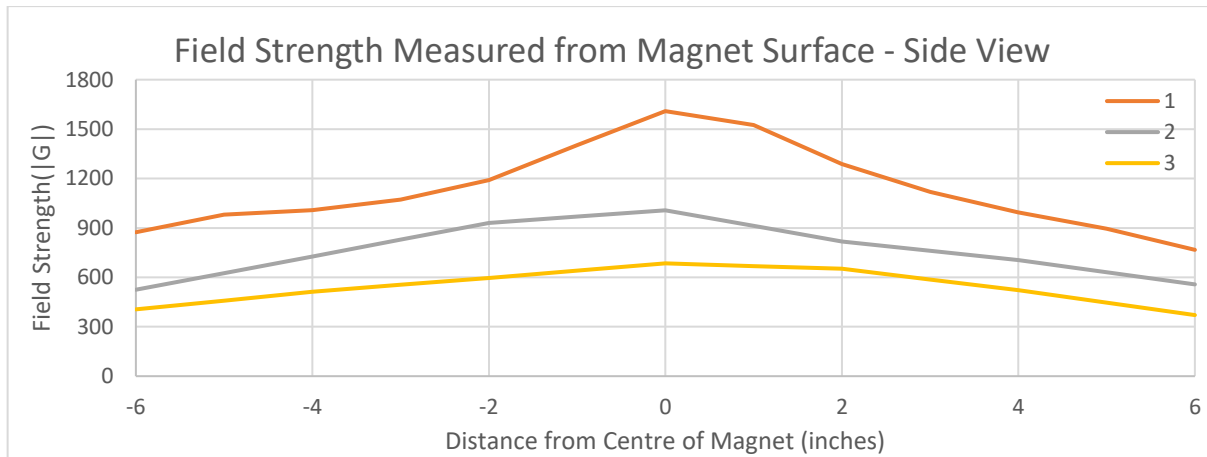


Figure 6: Field Strength Measured from Magnet Surface - Side View

Speed Testing Results

1/2-13 x 3 Bolt

Bolts were able to be picked up at relatively high speeds. In previous testing bolts got stuck between the magnet and the ground, this did not happen with the Seeker magnet, possibly due to the stronger field in the centre of the magnet.

	2"	3"
100%	22.8 km/h	16.1 km/h

90%	24.9 km/h	16.5 km/h
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Table 4: Speed to Pickup 100% and 90% of 1/2-13 x 3 Bolts (km/h)

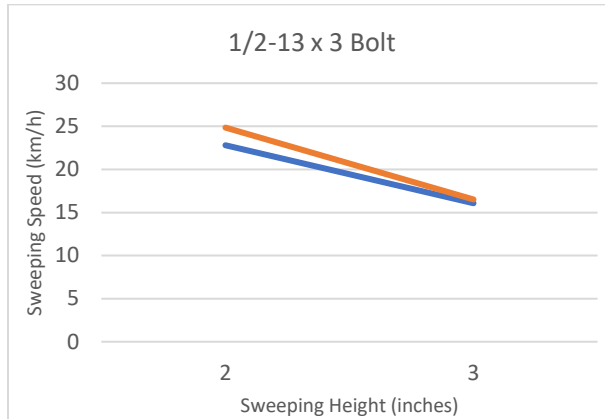


Figure 7: 90% to 100% Sweeping Window for 1/2-13 x 3 Bolts

1/2-13 Nut

The nuts were more difficult to pickup than the bolts due to the concentration of mass. Sweeping at 1" was attempted, however, the sweeper crossed over a bump and some collected nuts were wiped off.

	2"	3"
100%	16.5 km/h	15.2 km/h
90%	18.4 km/h	16.6 km/h

Table 5: Speed to Pickup 100% and 90% of 1/2-13 Nuts (km/h)



Figure 8: 90% to 100% Sweeping Window for 1/2-13 Nuts

7" Wire

The wire samples were relatively easy to collect, however, in some cases the wire would get caught on the carpet that is used to place debris. The sweeper was able to collect all debris samples at just over 20km/h.

	2"	3"
100%	21.6 km/h	21.4 km/h
90%	25.5 km/h	23.3 km/h

Table 6: Speed to Pickup 100% and 90% of 7" Wire Strips (km/h)

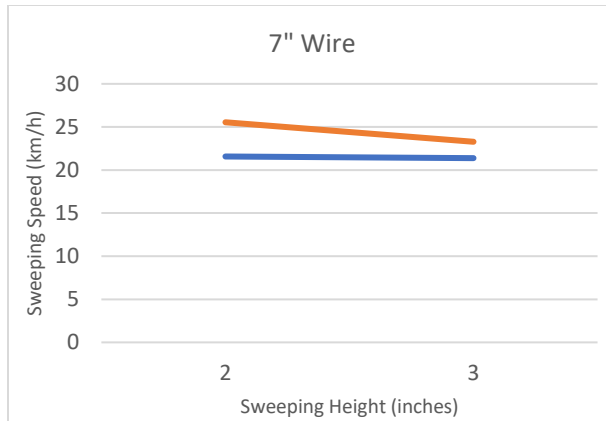


Figure 9: 90% to 100% Sweeping Window for 7" Wire Strips

Ball Bearing

Like nuts, ball bearings are very difficult debris to collect due to their geometry. The horseshoe configuration of the magnet combined with the length in the direction of travel allowed the sweeper to collect all samples at about 10km/h.

	2"	3"
100%	11.1 km/h	9.03 km/h
90%	15.2 km/h	11.7 km/h

Table 7: Speed to Pickup 100% and 90% of Ball Bearings (km/h)

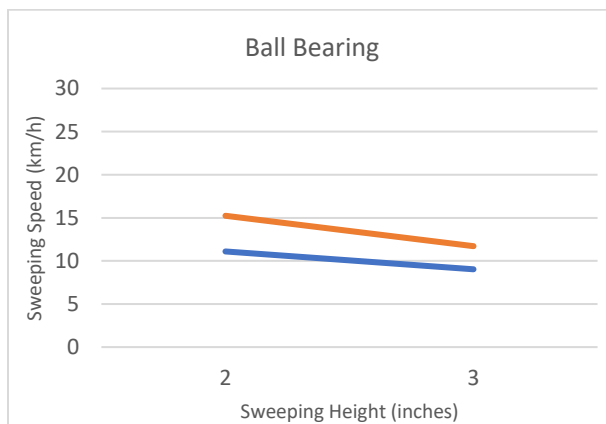


Figure 10: 90% to 100% Sweeping Window for Ball Bearings

Recommendations for Future Testing

If the testing carpet could be replaced with something smoother that would lead to more consistent results for debris that might get caught. Future testing should include lower sweeping heights.