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LAMPIRAN

LAMPIRAN HASIL EKSPERIMEN

Lampiran 1Dokumentasi Pengujian Navigasi Kapal

(a)

(b)

(c)

(d)

Gambar (a) pengujian system penggerak prototype, (b) Pengujian Sistem pengiriman data, (c) Persiapan Pengujian Sistem monitoring dan autopilot prototype, (d) Pengambilan data.

Lampiran 2 Data Hasil Autopilot (a) Waypoint Zigzag Plotting Google Maps (b) Waypoint Circle Ploting Plotting Google Maps

(a)

No.	Latitude	Longitude
1	-5.219254493713	119.500427246093
2	-5.219276428222	119.500427246093
3	-5.219284534454	119.500427246093
4	-5.219285964965	119.500404357910
5	-5.219286918640	119.500396728515
6	-5.219288825988	119.500396728515
7	-5.219286918640	119.500396728515
8	-5.219274997711	119.500381469726
9	-5.219262599945	119.500358581542
10	-5.219245433807	119.500328063964
11	-5.219237327575	119.500328063964
12	-5.219233989715	119.500320434570
13	-5.219216823577	119.500312805175
14	-5.219201087951	119.500297546386
15	-5.219192981719	119.500282287597
16	-5.219188690185	119.500282287597
17	-5.219177722930	119.500297546386
18	-5.219173431396	119.500297546386
19	-5.219166755676	119.500312805175
20	-5.219164848327	119.500312805175
21	-5.219164848327	119.500312805175
22	-5.219163894653	119.500320434570
23	-5.219164848327	119.500358581542
24	-5.219162464141	119.500381469726
25	-5.219155788421	119.500396728515
26	-5.219151020050	119.500396728515
27	-5.219137668609	119.500396728515
28	-5.219129562377	119.500396728515
29	-5.219122886657	119.500389099121
30	-5.219118118286	119.500358581542
31	-5.219115257263	119.500358581542
32	-5.219118595123	119.500312805175
33	-5.219120979309	119.500312805175
34	-5.219118118286	119.500267028808
35	-5.219110012054	119.500267028808
36	-5.219105720520	119.500267028808
37	-5.219093322753	119.500267028808
38	-5.219093322753	119.500267028808
39	-5.219088077545	119.500267028808
40	-5.219084739685	119.500267028808
41	-5.219079017639	119.500282287597
42	-5.219079017639	119.500312805175
43	-5.219083786010	119.500312805175
44	-5.219089984893	119.500328063964
45	-5.219110012054	119.500350952148
46	-5.219130516052	119.500358581542
47	-5.219135761260	119.500358581542
48	-5.219160079956	119.500381469726
49	-5.219168186187	119.500389099121
50	-5.219168186187	119.500389099121
51	-5.219208717346	119.500396728515

(b)

No.	Latitude	Longitude
1	-5.219215393066	119.500450134277
2	-5.219216823577	119.500434875488
3	-5.219223022460	119.500434875488
4	-5.219227790832	119.500434875488
5	-5.219229221343	119.500434875488
6	-5.219235897064	119.500427246093
7	-5.219251632690	119.500404357910
8	-5.219260692596	119.500396728515
9	-5.219276428222	119.500396728515
10	-5.219287395477	119.500396728515
11	-5.219297885894	119.500389099121
12	-5.219301700592	119.500381469726
13	-5.219303607940	119.500358581542
14	-5.219303607940	119.500320434570
15	-5.219301223754	119.500312805175
16	-5.219292640686	119.500297546386
17	-5.219279766082	119.500282287597
18	-5.219254016876	119.500267028808
19	-5.219248771667	119.500267028808
20	-5.219236850738	119.500267028808
21	-5.219197750091	119.500267028808
22	-5.219195842742	119.500267028808
23	-5.219192981719	119.500267028808
24	-5.219182491302	119.500267028808
25	-5.219177722930	119.500267028808
26	-5.219168186187	119.500282287597
27	-5.219163894653	119.500297546386
28	-5.219158649444	119.500312805175
29	-5.219157695770	119.500312805175
30	-5.219157218933	119.500320434570
31	-5.219157695770	119.500350952148
32	-5.219166755676	119.500381469726
33	-5.219168663024	119.500381469726

Lampiran 3 Hasil Autopilot (a) Waypoint Zigzag Plotting Manual RC (b) Waypoint Circle Plotting Manual RC

(a)

No	Latitude	Longitude
1	-5.219231605529	119.500427246093
2	-5.219246864318	119.500427246093
3	-5.219260692596	119.500404357910
4	-5.219276428222	119.500404357910
5	-5.219305992126	119.500404357910
6	-5.219312191009	119.500404357910
7	-5.219342708587	119.500396728515
8	-5.219347953796	119.500396728515
9	-5.219352722167	119.500389099121
10	-5.219363689422	119.500358581542
11	-5.219361305236	119.500350952148
12	-5.219347000122	119.500328063964
13	-5.219337463378	119.500320434570
14	-5.219334125518	119.500312805175
15	-5.219316959381	119.500312805175
16	-5.219295501708	119.500267028808
17	-5.219291687011	119.500267028808
18	-5.219264984130	119.500244140625
19	-5.219232559204	119.500205993652
20	-5.219223022460	119.500183105468
21	-5.219213962554	119.500183105468
22	-5.219190120697	119.500190734863
23	-5.219183921813	119.500205993652
24	-5.219182014465	119.500205993652
25	-5.219179153442	119.500205993652
26	-5.219171047210	119.500221252441
27	-5.219168186187	119.500228881835
28	-5.219162464141	119.500228881835
29	-5.219157695770	119.500251770019
30	-5.219154357910	119.500251770019
31	-5.219149589538	119.500267028808
32	-5.219145774841	119.500267028808
33	-5.219142913818	119.500267028808
34	-5.219140529632	119.500282287597
35	-5.219134807586	119.500297546386
36	-5.219133853912	119.500312805175
37	-5.219129085540	119.500312805175
38	-5.219123840332	119.500320434570
39	-5.219118595123	119.500328063964
40	-5.219100952148	119.500328063964
41	-5.219088554382	119.500328063964
42	-5.219084739685	119.500328063964
43	-5.219079494476	119.500320434570
44	-5.219069480895	119.500312805175
45	-5.219057083129	119.500267028808
46	-5.219048976898	119.500244140625
47	-5.219046592712	119.500244140625
48	-5.219043254852	119.500228881835
49	-5.219036579132	119.500205993652
50	-5.219031810760	119.500205993652
51	-5.219017982482	119.500183105468
52	-5.218991756439	119.500205993652
53	-5.218987941741	119.500221252441
54	-5.218987941741	119.500228881835
55	-5.218989849090	119.500244140625
56	-5.218989849090	119.500251770019
57	-5.218996047973	119.500267028808
58	-5.219007492065	119.500312805175
59	-5.219010353088	119.500312805175
60	-5.219024658203	119.500328063964
61	-5.219059944152	119.500358581542
62	-5.219063758850	119.500358581542
63	-5.219079494476	119.500358581542
64	-5.219089984893	119.500381469726
65	-5.219096660614	119.500389099121
66	-5.219112873077	119.500396728515
67	-5.219118595123	119.500396728515
68	-5.219142913818	119.500396728515
69	-5.219171047210	119.500404357910
70	-5.219226360321	119.500396728515

(b)

No	Latitude	Longitude
1	-5.219202995300	119.5004501343
2	-5.219225883483	119.5004348755
3	-5.219238758087	119.5004272461
4	-5.219252586364	119.5004272461
5	-5.219297885894	119.5004043579
6	-5.219347000122	119.5003967285
7	-5.219365596771	119.5003967285
8	-5.219374656677	119.5003890991
9	-5.219377994537	119.5003814697
10	-5.219381809234	119.5003814697
11	-5.219381809234	119.5003585815
12	-5.219380855560	119.5003585815
13	-5.219377994537	119.5003585815
14	-5.219368934631	119.5003509521
15	-5.219359397888	119.5003509521
16	-5.219356060028	119.5003509521
17	-5.219350337982	119.5003509521
18	-5.219323635101	119.5003280640
19	-5.219317436218	119.5003204346
20	-5.219314575195	119.5003128052
21	-5.219315528869	119.5002670288
22	-5.219318866729	119.5002441406
23	-5.219315528869	119.5002288818
24	-5.219291687011	119.5002288818
25	-5.219286918640	119.5002212524
26	-5.219271659851	119.5002212524
27	-5.219254493713	119.5002212524
28	-5.219236850738	119.5002212524
29	-5.219230651855	119.5002212524
30	-5.219201087951	119.5002059937
31	-5.219194889068	119.5002059937
32	-5.219190120697	119.5002059937
33	-5.219168663024	119.5002059937
34	-5.219161987304	119.5002059937
35	-5.219154357910	119.5002212524
36	-5.219142913818	119.5002288818
37	-5.219135761260	119.5002288818
38	-5.219132423400	119.5002441406
39	-5.219130516052	119.5002517700
40	-5.219125747680	119.5002670288
41	-5.219112873077	119.5002975464
42	-5.219110012054	119.5003128052
43	-5.219107151031	119.5003128052
44	-5.219102859497	119.5003204346
45	-5.219103813171	119.5003204346
46	-5.219104290008	119.5003280640
47	-5.219110488891	119.5003509521
48	-5.219122886657	119.5003814697
49	-5.219124794006	119.5003890991
50	-5.219130516052	119.5003967285
51	-5.219138622283	119.5003967285
52	-5.219129085540	119.5003967285
53	-5.219143390655	119.5003967285
54	-5.219161987304	119.5003967285
55	-5.219168186187	119.5004043579
56	-5.219180583953	119.5004272461
57	-5.219185829162	119.5004272461
58	-5.219199657440	119.5004272461
59	-5.219213962554	119.5004043579

Lampiran 4 Data Hasil Autopilot Waypilot zigzag Plotting Google Maps

No.	Returned MMSI	Waktu	Latitude	Longitude	RPM	SOG (kn)	COG (°)	Heading Error (°)	Distance to Target (m)
1	316001245 (12D5CBDD)	0:00:00	-5.219254493713	119.500427246093	0	0	243	43	7
2	316001245 (12D5CBDD)	0:00:01	-5.219254493713	119.500427246093	502	0	253	42	7
3	316001245 (12D5CBDD)	0:00:02	-5.219254493713	119.500427246093	731	0	253	40	7
4	316001245 (12D5CBDD)	0:00:03	-5.219264984130	119.500427246093	731	1	262	47	6
5	316001245 (12D5CBDD)	0:00:04	-5.219264984130	119.500427246093	731	1	262	44	6
6	316001245 (12D5CBDD)	0:00:05	-5.219264984130	119.500427246093	702	1	262	41	6
7	316001245 (12D5CBDD)	0:00:06	-5.219269752502	119.500427246093	702	0.9	266	43	5
8	316001245 (12D5CBDD)	0:00:07	-5.219269752502	119.500427246093	702	0.9	266	41	5
9	316001245 (12D5CBDD)	0:00:08	-5.219269752502	119.500427246093	702	0.9	266	39	5
10	316001245 (12D5CBDD)	0:00:09	-5.219269752502	119.500427246093	702	0.9	266	37	5
11	316001245 (12D5CBDD)	0:00:10	-5.219276428222	119.500427246093	702	0.9	274	42	5
12	316001245 (12D5CBDD)	0:00:11	-5.219276428222	119.500427246093	702	0.9	274	40	5
13	316001245 (12D5CBDD)	0:00:12	-5.219276428222	119.500427246093	702	0.9	274	38	5
14	316001245 (12D5CBDD)	0:00:13	-5.219276428222	119.500427246093	702	0.9	274	36	5
15	316001245 (12D5CBDD)	0:00:14	-5.219276428222	119.500427246093	702	0.9	274	34	5
16	316001245 (12D5CBDD)	0:00:15	-5.219276428222	119.500427246093	702	0.9	274	33	5
17	316001245 (12D5CBDD)	0:00:16	-5.219276428222	119.500427246093	702	0.9	274	29	5
18	316001245 (12D5CBDD)	0:00:17	-5.219276428222	119.500427246093	673	0.9	274	28	5
19	316001245 (12D5CBDD)	0:00:18	-5.219284534454	119.500427246093	673	0.9	274	35	6
20	316001245 (12D5CBDD)	0:00:19	-5.219284534454	119.500427246093	673	0.8	282	31	6
21	316001245 (12D5CBDD)	0:00:20	-5.219284534454	119.500427246093	673	0.8	282	29	6
22	316001245 (12D5CBDD)	0:00:21	-5.219284534454	119.500427246093	673	0.8	282	27	6
23	316001245 (12D5CBDD)	0:00:22	-5.219285964965	119.500404357910	655	0.8	282	29	5
24	316001245 (12D5CBDD)	0:00:23	-5.219285964965	119.500404357910	655	0.7	286	27	5
25	316001245 (12D5CBDD)	0:00:24	-5.219285964965	119.500404357910	655	0.7	286	25	5
26	316001245 (12D5CBDD)	0:00:25	-5.219285964965	119.500404357910	655	0.7	286	23	5
27	316001245 (12D5CBDD)	0:00:26	-5.219286918640	119.500396728515	655	0.7	290	24	4
28	316001245 (12D5CBDD)	0:00:27	-5.219286918640	119.500396728515	655	0.7	290	22	4
29	316001245 (12D5CBDD)	0:00:28	-5.219286918640	119.500396728515	655	0.7	290	21	4
30	316001245 (12D5CBDD)	0:00:29	-5.219286918640	119.500396728515	655	0.7	290	19	4
31	316001245 (12D5CBDD)	0:00:30	-5.219286918640	119.500396728515	655	0.7	290	18	4
32	316001245 (12D5CBDD)	0:00:31	-5.219286918640	119.500396728515	655	0.7	290	15	4
33	316001245 (12D5CBDD)	0:00:32	-5.219286918640	119.500396728515	655	0.7	290	14	4
34	316001245 (12D5CBDD)	0:00:33	-5.219286918640	119.500396728515	655	0.7	290	10	4
35	316001245 (12D5CBDD)	0:00:34	-5.219288825988	119.500396728515	655	0.7	296	14	3
36	316001245 (12D5CBDD)	0:00:35	-5.219288825988	119.500396728515	655	0.7	296	13	3
37	316001245 (12D5CBDD)	0:00:36	-5.219288825988	119.500396728515	655	0.7	296	12	3
38	316001245 (12D5CBDD)	0:00:37	-5.219288825988	119.500396728515	655	0.7	296	10	3
39	316001245 (12D5CBDD)	0:00:38	-5.219288825988	119.500396728515	655	0.7	296	7	3
40	316001245 (12D5CBDD)	0:00:39	-5.219288825988	119.500396728515	655	0.7	296	5	3
41	316001245 (12D5CBDD)	0:00:40	-5.219288825988	119.500396728515	655	0.7	296	5	3
42	316001245 (12D5CBDD)	0:00:41	-5.219288825988	119.500396728515	702	0.7	296	0	3
43	316001245 (12D5CBDD)	0:00:42	-5.219286918640	119.500396728515	702	0.7	300	5	2
44	316001245 (12D5CBDD)	0:00:43	-5.219286918640	119.500396728515	702	0.7	300	6	2
45	316001245 (12D5CBDD)	0:00:44	-5.219286918640	119.500396728515	702	0.7	300	0	2
46	316001245 (12D5CBDD)	0:00:45	-5.219274997711	119.500381469726	731	0.7	300	8	9
47	316001245 (12D5CBDD)	0:00:46	-5.219274997711	119.500381469726	731	1	306	6	9
48	316001245 (12D5CBDD)	0:00:47	-5.219274997711	119.500381469726	731	1	306	7	9
49	316001245 (12D5CBDD)	0:00:48	-5.219274997711	119.500381469726	731	1	306	6	9
50	316001245 (12D5CBDD)	0:00:49	-5.219274997711	119.500381469726	731	1	306	5	9

51	316001245 (12D5CBDD)	0:00:50	-5.219274997711	119.500381469726	731	1	306	0	9
52	316001245 (12D5CBDD)	0:00:51	-5.219262599945	119.500358581542	731	1	307	0	7
53	316001245 (12D5CBDD)	0:00:52	-5.219245433807	119.500328063964	731	1	307	0	4
54	316001245 (12D5CBDD)	0:00:53	-5.219237327575	119.500328063964	791	1.2	302	0	3
55	316001245 (12D5CBDD)	0:00:54	-5.219233989715	119.500320434570	767	1.1	302	0	2
56	316001245 (12D5CBDD)	0:00:55	-5.219216823577	119.500312805175	767	1.1	302	60	7
57	316001245 (12D5CBDD)	0:00:56	-5.219201087951	119.500297546386	702	0.9	59	60	7
58	316001245 (12D5CBDD)	0:00:57	-5.219192981719	119.500282287597	673	0.8	67	60	8
59	316001245 (12D5CBDD)	0:00:58	-5.219188690185	119.500282287597	655	0.7	70	60	8
60	316001245 (12D5CBDD)	0:00:59	-5.219188690185	119.500282287597	655	0.7	70	57	8
61	316001245 (12D5CBDD)	0:01:00	-5.219188690185	119.500282287597	655	0.7	70	54	8
62	316001245 (12D5CBDD)	0:01:01	-5.219188690185	119.500282287597	655	0.7	70	51	8
63	316001245 (12D5CBDD)	0:01:02	-5.219188690185	119.500282287597	655	0.7	70	46	8
64	316001245 (12D5CBDD)	0:01:03	-5.219188690185	119.500282287597	655	0.7	70	44	8
65	316001245 (12D5CBDD)	0:01:04	-5.219188690185	119.500282287597	655	0.7	70	39	8
66	316001245 (12D5CBDD)	0:01:05	-5.219188690185	119.500282287597	655	0.7	70	33	8
67	316001245 (12D5CBDD)	0:01:06	-5.219188690185	119.500282287597	655	0.7	70	30	8
68	316001245 (12D5CBDD)	0:01:07	-5.219177722930	119.500297546386	655	0.7	70	34	6
69	316001245 (12D5CBDD)	0:01:08	-5.219177722930	119.500297546386	655	0.7	78	32	6
70	316001245 (12D5CBDD)	0:01:09	-5.219177722930	119.500297546386	655	0.7	78	27	6
71	316001245 (12D5CBDD)	0:01:10	-5.219177722930	119.500297546386	655	0.7	78	25	6
72	316001245 (12D5CBDD)	0:01:11	-5.219173431396	119.500297546386	655	0.7	78	26	6
73	316001245 (12D5CBDD)	0:01:12	-5.219173431396	119.500297546386	655	0.7	82	23	6
74	316001245 (12D5CBDD)	0:01:13	-5.219173431396	119.500297546386	655	0.7	82	17	6
75	316001245 (12D5CBDD)	0:01:14	-5.219173431396	119.500297546386	655	0.7	82	14	6
76	316001245 (12D5CBDD)	0:01:15	-5.219173431396	119.500297546386	655	0.7	82	11	6
77	316001245 (12D5CBDD)	0:01:16	-5.219173431396	119.500297546386	655	0.7	82	8	6
78	316001245 (12D5CBDD)	0:01:17	-5.219173431396	119.500297546386	655	0.7	82	0	6
79	316001245 (12D5CBDD)	0:01:18	-5.219166755676	119.500312805175	655	0.7	87	0	5
80	316001245 (12D5CBDD)	0:01:19	-5.219164848327	119.500312805175	655	0.7	90	0	5
81	316001245 (12D5CBDD)	0:01:20	-5.219164848327	119.500312805175	655	0.7	90	-5	5
82	316001245 (12D5CBDD)	0:01:21	-5.219164848327	119.500312805175	655	0.7	90	0	5
83	316001245 (12D5CBDD)	0:01:22	-5.219164848327	119.500312805175	655	0.7	90	-5	5
84	316001245 (12D5CBDD)	0:01:23	-5.219164848327	119.500312805175	655	0.7	90	0	5
85	316001245 (12D5CBDD)	0:01:24	-5.219164848327	119.500312805175	655	0.7	90	-5	5
86	316001245 (12D5CBDD)	0:01:25	-5.219164848327	119.500312805175	655	0.7	90	0	5
87	316001245 (12D5CBDD)	0:01:26	-5.219164848327	119.500312805175	673	0.7	90	0	5
88	316001245 (12D5CBDD)	0:01:27	-5.219164848327	119.500312805175	673	0.7	90	0	5
89	316001245 (12D5CBDD)	0:01:28	-5.219164848327	119.500312805175	702	0.7	90	-5	5
90	316001245 (12D5CBDD)	0:01:29	-5.219163894653	119.500320434570	702	0.7	90	0	3
91	316001245 (12D5CBDD)	0:01:30	-5.219163894653	119.500320434570	702	0.9	91	-5	3
92	316001245 (12D5CBDD)	0:01:31	-5.219163894653	119.500320434570	702	0.9	91	0	3
93	316001245 (12D5CBDD)	0:01:32	-5.219164848327	119.500358581542	702	0.9	91	-60	9
94	316001245 (12D5CBDD)	0:01:33	-5.219162464141	119.500381469726	731	1	297	-60	11
95	316001245 (12D5CBDD)	0:01:34	-5.219155788421	119.500396728515	731	1	297	-60	12
96	316001245 (12D5CBDD)	0:01:35	-5.219151020050	119.500396728515	673	0.8	287	-60	12
97	316001245 (12D5CBDD)	0:01:36	-5.219151020050	119.500396728515	673	0.8	287	-57	12
98	316001245 (12D5CBDD)	0:01:37	-5.219151020050	119.500396728515	673	0.8	287	-54	12
99	316001245 (12D5CBDD)	0:01:38	-5.219151020050	119.500396728515	673	0.8	287	-50	12
100	316001245 (12D5CBDD)	0:01:39	-5.219151020050	119.500396728515	673	0.8	287	-47	12
101	316001245 (12D5CBDD)	0:01:40	-5.219151020050	119.500396728515	655	0.8	287	-44	12
102	316001245 (12D5CBDD)	0:01:41	-5.219137668609	119.500396728515	655	0.8	287	-50	12
103	316001245 (12D5CBDD)	0:01:42	-5.219137668609	119.500396728515	655	0.7	280	-47	12
104	316001245 (12D5CBDD)	0:01:43	-5.219137668609	119.500396728515	655	0.7	280	-46	12
105	316001245 (12D5CBDD)	0:01:44	-5.219137668609	119.500396728515	655	0.7	280	-42	12

106	316001245 (12D5CBDD)	0:01:45	-5.219137668609	119.500396728515	655	0.7	280	-40	12
107	316001245 (12D5CBDD)	0:01:46	-5.219137668609	119.500396728515	655	0.7	280	-38	12
108	316001245 (12D5CBDD)	0:01:47	-5.219137668609	119.500396728515	655	0.7	280	-35	12
109	316001245 (12D5CBDD)	0:01:48	-5.219137668609	119.500396728515	655	0.7	280	-34	12
110	316001245 (12D5CBDD)	0:01:49	-5.219129562377	119.500396728515	655	0.7	277	-34	11
111	316001245 (12D5CBDD)	0:01:50	-5.219129562377	119.500396728515	655	0.7	277	-30	11
112	316001245 (12D5CBDD)	0:01:51	-5.219129562377	119.500396728515	655	0.7	277	-28	11
113	316001245 (12D5CBDD)	0:01:52	-5.219129562377	119.500396728515	655	0.7	277	-25	11
114	316001245 (12D5CBDD)	0:01:53	-5.219129562377	119.500396728515	655	0.7	277	-26	11
115	316001245 (12D5CBDD)	0:01:54	-5.219129562377	119.500396728515	655	0.7	277	-23	11
116	316001245 (12D5CBDD)	0:01:55	-5.219129562377	119.500396728515	655	0.7	277	-21	11
117	316001245 (12D5CBDD)	0:01:56	-5.219129562377	119.500396728515	655	0.7	277	-19	11
118	316001245 (12D5CBDD)	0:01:57	-5.219129562377	119.500396728515	655	0.7	277	-16	11
119	316001245 (12D5CBDD)	0:01:58	-5.219129562377	119.500396728515	655	0.7	277	-15	11
120	316001245 (12D5CBDD)	0:01:59	-5.219129562377	119.500396728515	655	0.7	277	-14	11
121	316001245 (12D5CBDD)	0:02:00	-5.219122886657	119.500389099121	655	0.7	277	-16	11
122	316001245 (12D5CBDD)	0:02:01	-5.219122886657	119.500389099121	655	0.7	273	-14	11
123	316001245 (12D5CBDD)	0:02:02	-5.219122886657	119.500389099121	655	0.7	273	-13	11
124	316001245 (12D5CBDD)	0:02:03	-5.219122886657	119.500389099121	655	0.7	273	-12	11
125	316001245 (12D5CBDD)	0:02:04	-5.219122886657	119.500389099121	655	0.7	273	-9	11
126	316001245 (12D5CBDD)	0:02:05	-5.219122886657	119.500389099121	655	0.7	273	-9	11
127	316001245 (12D5CBDD)	0:02:06	-5.219122886657	119.500389099121	693	0.7	273	-7	11
128	316001245 (12D5CBDD)	0:02:07	-5.219122886657	119.500389099121	702	0.7	273	-6	11
129	316001245 (12D5CBDD)	0:02:08	-5.219122886657	119.500389099121	702	0.7	273	0	11
130	316001245 (12D5CBDD)	0:02:09	-5.219118118286	119.500358581542	702	0.9	270	-5	9
131	316001245 (12D5CBDD)	0:02:10	-5.219118118286	119.500358581542	702	0.9	270	0	9
132	316001245 (12D5CBDD)	0:02:11	-5.219118118286	119.500358581542	702	0.9	270	0	9
133	316001245 (12D5CBDD)	0:02:12	-5.219115257263	119.500358581542	702	0.9	270	-5	7
134	316001245 (12D5CBDD)	0:02:13	-5.219115257263	119.500358581542	767	1.1	268	0	7
135	316001245 (12D5CBDD)	0:02:14	-5.219115257263	119.500358581542	767	1.1	268	-5	7
136	316001245 (12D5CBDD)	0:02:15	-5.219115257263	119.500350952148	767	1.1	268	0	6
137	316001245 (12D5CBDD)	0:02:16	-5.219115257263	119.500350952148	767	1.1	268	-5	6
138	316001245 (12D5CBDD)	0:02:17	-5.219115257263	119.500350952148	767	1.1	268	0	6
139	316001245 (12D5CBDD)	0:02:18	-5.219115257263	119.500328063964	791	1.2	268	0	5
140	316001245 (12D5CBDD)	0:02:19	-5.219118595123	119.500312805175	791	1.2	274	7	2
141	316001245 (12D5CBDD)	0:02:20	-5.219118595123	119.500312805175	791	1.2	274	6	2
142	316001245 (12D5CBDD)	0:02:21	-5.219118595123	119.500312805175	791	1.2	274	5	2
143	316001245 (12D5CBDD)	0:02:22	-5.219120979309	119.500312805175	723	1.2	72	60	4
144	316001245 (12D5CBDD)	0:02:23	-5.219118118286	119.500267028808	702	1.2	71	60	6
145	316001245 (12D5CBDD)	0:02:24	-5.219110012054	119.500267028808	655	0.7	89	60	7
146	316001245 (12D5CBDD)	0:02:25	-5.219105720520	119.500267028808	655	0.7	92	60	7
147	316001245 (12D5CBDD)	0:02:26	-5.219093322753	119.500267028808	655	0.7	92	60	7
148	316001245 (12D5CBDD)	0:02:27	-5.219093322753	119.500267028808	655	0.7	102	55	7
149	316001245 (12D5CBDD)	0:02:28	-5.219088077545	119.500267028808	655	0.7	109	59	7
150	316001245 (12D5CBDD)	0:02:29	-5.219088077545	119.500267028808	655	0.7	109	55	7
151	316001245 (12D5CBDD)	0:02:30	-5.219088077545	119.500267028808	655	0.7	109	50	7
152	316001245 (12D5CBDD)	0:02:31	-5.219088077545	119.500267028808	655	0.7	109	47	7
153	316001245 (12D5CBDD)	0:02:32	-5.219084739685	119.500267028808	655	0.7	111	46	7
154	316001245 (12D5CBDD)	0:02:33	-5.219084739685	119.500267028808	655	0.7	111	43	7
155	316001245 (12D5CBDD)	0:02:34	-5.219084739685	119.500267028808	655	0.7	111	38	7
156	316001245 (12D5CBDD)	0:02:35	-5.219084739685	119.500267028808	655	0.7	111	35	7
157	316001245 (12D5CBDD)	0:02:36	-5.219084739685	119.500267028808	655	0.7	111	33	7
158	316001245 (12D5CBDD)	0:02:37	-5.219084739685	119.500267028808	655	0.7	111	30	7
159	316001245 (12D5CBDD)	0:02:38	-5.219084739685	119.500267028808	655	0.7	111	25	7
160	316001245 (12D5CBDD)	0:02:39	-5.219084739685	119.500267028808	655	0.7	111	22	7

161	316001245 (12D5CBDD)	0:02:40	-5.219084739685	119.500267028808	655	0.7	111	19	7
162	316001245 (12D5CBDD)	0:02:41	-5.219084739685	119.500267028808	655	0.7	111	16	7
163	316001245 (12D5CBDD)	0:02:42	-5.219084739685	119.500267028808	655	0.7	111	12	7
164	316001245 (12D5CBDD)	0:02:43	-5.219079017639	119.500282287597	655	0.7	111	15	6
165	316001245 (12D5CBDD)	0:02:44	-5.219079017639	119.500282287597	655	0.7	118	12	6
166	316001245 (12D5CBDD)	0:02:45	-5.219079017639	119.500282287597	655	0.7	118	11	6
167	316001245 (12D5CBDD)	0:02:46	-5.219079017639	119.500282287597	655	0.7	118	7	6
168	316001245 (12D5CBDD)	0:02:47	-5.219079017639	119.500282287597	655	0.7	118	0	6
169	316001245 (12D5CBDD)	0:02:48	-5.219079017639	119.500282287597	702	0.7	118	-6	6
170	316001245 (12D5CBDD)	0:02:49	-5.219079017639	119.500282287597	702	0.7	118	0	6
171	316001245 (12D5CBDD)	0:02:50	-5.219079017639	119.500282287597	702	0.7	118	-6	6
172	316001245 (12D5CBDD)	0:02:51	-5.219079017639	119.500312805175	731	0.7	127	0	5
173	316001245 (12D5CBDD)	0:02:52	-5.219083786010	119.500312805175	731	0.7	127	13	3
174	316001245 (12D5CBDD)	0:02:53	-5.219083786010	119.500312805175	731	1	137	14	3
175	316001245 (12D5CBDD)	0:02:54	-5.219083786010	119.500312805175	731	1	137	12	3
176	316001245 (12D5CBDD)	0:02:55	-5.219083786010	119.500312805175	731	1	137	11	3
177	316001245 (12D5CBDD)	0:02:56	-5.219086647033	119.500320434570	731	1	137	19	3
178	316001245 (12D5CBDD)	0:02:57	-5.219086647033	119.500320434570	731	1	146	15	3
179	316001245 (12D5CBDD)	0:02:58	-5.219086647033	119.500320434570	731	1	146	15	3
180	316001245 (12D5CBDD)	0:02:59	-5.219086647033	119.500320434570	731	1	146	11	3
181	316001245 (12D5CBDD)	0:03:00	-5.219089984893	119.500328063964	767	1.1	158	20	2
182	316001245 (12D5CBDD)	0:03:01	-5.219089984893	119.500328063964	767	1.1	158	16	2
183	316001245 (12D5CBDD)	0:03:02	-5.219089984893	119.500328063964	767	1.1	158	13	2
184	316001245 (12D5CBDD)	0:03:03	-5.219089984893	119.500328063964	767	1.1	158	12	2
185	316001245 (12D5CBDD)	0:03:04	-5.219089984893	119.500328063964	767	1.1	158	9	2
186	316001245 (12D5CBDD)	0:03:05	-5.219089984893	119.500328063964	767	1.1	158	0	2
187	316001245 (12D5CBDD)	0:03:06	-5.219089984893	119.500328063964	767	1.1	158	-5	2
188	316001245 (12D5CBDD)	0:03:07	-5.219089984893	119.500328063964	767	1.1	158	0	2
189	316001245 (12D5CBDD)	0:03:08	-5.219089984893	119.500328063964	767	1.1	158	-6	2
190	316001245 (12D5CBDD)	0:03:09	-5.219089984893	119.500328063964	767	1.1	158	-6	2
191	316001245 (12D5CBDD)	0:03:10	-5.219089984893	119.500328063964	767	1.1	158	-5	2
192	316001245 (12D5CBDD)	0:03:11	-5.219089984893	119.500328063964	767	1.1	158	-6	2
193	316001245 (12D5CBDD)	0:03:12	-5.219089984893	119.500328063964	767	1.1	158	0	2
194	316001245 (12D5CBDD)	0:03:13	-5.219110012054	119.500350952148	767	1.1	158	-7	9
195	316001245 (12D5CBDD)	0:03:14	-5.219110012054	119.500350952148	731	1	154	-8	9
196	316001245 (12D5CBDD)	0:03:15	-5.219110012054	119.500350952148	731	1	154	-9	9
197	316001245 (12D5CBDD)	0:03:16	-5.219110012054	119.500350952148	731	1	154	-8	9
198	316001245 (12D5CBDD)	0:03:17	-5.219110012054	119.500350952148	731	1	154	-6	9
199	316001245 (12D5CBDD)	0:03:18	-5.219110012054	119.500350952148	731	1	154	-6	9
200	316001245 (12D5CBDD)	0:03:19	-5.219110012054	119.500350952148	731	1	154	-5	9
201	316001245 (12D5CBDD)	0:03:20	-5.219110012054	119.500350952148	731	1	154	0	9
202	316001245 (12D5CBDD)	0:03:21	-5.219130516052	119.500358581542	791	1.2	152	0	7
203	316001245 (12D5CBDD)	0:03:22	-5.219135761260	119.500358581542	767	1.1	156	0	6
204	316001245 (12D5CBDD)	0:03:23	-5.219160079956	119.500381469726	767	1.1	156	11	3
205	316001245 (12D5CBDD)	0:03:24	-5.219160079956	119.500381469726	791	1.2	165	10	3
206	316001245 (12D5CBDD)	0:03:25	-5.219160079956	119.500381469726	791	1.2	165	11	3
207	316001245 (12D5CBDD)	0:03:26	-5.219160079956	119.500381469726	791	1.2	165	8	3
208	316001245 (12D5CBDD)	0:03:27	-5.219160079956	119.500381469726	791	1.2	165	7	3
209	316001245 (12D5CBDD)	0:03:28	-5.219160079956	119.500381469726	791	1.2	165	6	3
210	316001245 (12D5CBDD)	0:03:29	-5.219160079956	119.500381469726	791	1.2	165	0	3
211	316001245 (12D5CBDD)	0:03:30	-5.219168186187	119.500389099121	791	1.2	180	17	2
212	316001245 (12D5CBDD)	0:03:31	-5.219168186187	119.500389099121	791	1.2	180	16	2
213	316001245 (12D5CBDD)	0:03:32	-5.219168186187	119.500389099121	791	1.2	180	15	2
214	316001245 (12D5CBDD)	0:03:33	-5.219168186187	119.500389099121	791	1.2	180	12	2
215	316001245 (12D5CBDD)	0:03:34	-5.219168186187	119.500389099121	791	1.2	180	10	2

216	316001245 (12D5CBDD)	0:03:35	-5.219168186187	119.500389099121	791	1.2	180	7	2
217	316001245 (12D5CBDD)	0:03:36	-5.219168186187	119.500389099121	791	1.2	180	5	2
218	316001245 (12D5CBDD)	0:03:37	-5.219168186187	119.500389099121	791	1.2	180	0	2
219	316001245 (12D5CBDD)	0:03:38	-5.219168186187	119.500389099121	791	1.2	180	-5	2
220	316001245 (12D5CBDD)	0:03:39	-5.219168186187	119.500389099121	0	1.2	180	0	2
221	316001245 (12D5CBDD)	0:03:40	-5.219208717346	119.500396728515	0	0.5	166	0	0

Lampiran 5 Data hasil Autopilot Waypoint Circle Plotting Google Maps

No.	Returned MMSI	Waktu	Latitude	Longitude	RPM	SOG (kn)	COG (o)	Heading Error (o)	Distance to Target (m)
1	316001245 (12D5CBDD)	0:00:00	-5.219235897064	119.500427246093	0	0	220	-6	7
2	316001245 (12D5CBDD)	0:00:01	-5.219235897064	119.500427246093	621	0	219	-7	7
3	316001245 (12D5CBDD)	0:00:02	-5.219235897064	119.500427246093	702	0.6	219	-8	7
4	316001245 (12D5CBDD)	0:00:03	-5.219235897064	119.500427246093	702	0.9	219	-8	7
5	316001245 (12D5CBDD)	0:00:04	-5.219235897064	119.500427246093	702	0.9	219	-8	7
6	316001245 (12D5CBDD)	0:00:05	-5.219235897064	119.500427246093	702	0.9	219	-8	7
7	316001245 (12D5CBDD)	0:00:06	-5.219235897064	119.500427246093	702	0.9	219	-9	7
8	316001245 (12D5CBDD)	0:00:07	-5.219235897064	119.500427246093	702	0.9	219	-7	7
9	316001245 (12D5CBDD)	0:00:08	-5.219235897064	119.500427246093	702	0.9	219	-8	7
10	316001245 (12D5CBDD)	0:00:09	-5.219235897064	119.500427246093	702	0.9	219	-8	7
11	316001245 (12D5CBDD)	0:00:10	-5.219235897064	119.500427246093	702	0.9	219	-7	7
12	316001245 (12D5CBDD)	0:00:11	-5.219235897064	119.500427246093	702	0.9	219	-7	7
13	316001245 (12D5CBDD)	0:00:12	-5.219235897064	119.500427246093	767	0.9	219	-8	7
14	316001245 (12D5CBDD)	0:00:13	-5.219235897064	119.500427246093	767	0.9	219	-6	7
15	316001245 (12D5CBDD)	0:00:14	-5.219235897064	119.500427246093	767	0.9	219	-7	7
16	316001245 (12D5CBDD)	0:00:15	-5.219251632690	119.500404357910	767	0.9	219	-8	5
17	316001245 (12D5CBDD)	0:00:16	-5.219251632690	119.500404357910	767	1.1	216	-9	5
18	316001245 (12D5CBDD)	0:00:17	-5.219251632690	119.500404357910	767	1.1	216	-9	5
19	316001245 (12D5CBDD)	0:00:18	-5.219251632690	119.500404357910	767	1.1	216	-8	5
20	316001245 (12D5CBDD)	0:00:19	-5.219251632690	119.500404357910	767	1.1	216	-8	5
21	316001245 (12D5CBDD)	0:00:20	-5.219251632690	119.500404357910	767	1.1	216	-7	5
22	316001245 (12D5CBDD)	0:00:21	-5.219251632690	119.500404357910	767	1.1	216	-7	5
23	316001245 (12D5CBDD)	0:00:22	-5.219251632690	119.500404357910	767	1.1	216	-6	5
24	316001245 (12D5CBDD)	0:00:23	-5.219260692596	119.500396728515	767	1.1	215	-6	4
25	316001245 (12D5CBDD)	0:00:24	-5.219260692596	119.500396728515	767	1.1	215	-8	4
26	316001245 (12D5CBDD)	0:00:25	-5.219260692596	119.500396728515	767	1.1	215	-6	4
27	316001245 (12D5CBDD)	0:00:26	-5.219260692596	119.500396728515	767	1.1	215	-7	4
28	316001245 (12D5CBDD)	0:00:27	-5.219260692596	119.500396728515	767	1.1	215	-5	4
29	316001245 (12D5CBDD)	0:00:28	-5.219260692596	119.500396728515	767	1.1	215	-6	4
30	316001245 (12D5CBDD)	0:00:29	-5.219260692596	119.500396728515	767	1.1	215	-5	4
31	316001245 (12D5CBDD)	0:00:30	-5.219260692596	119.500396728515	767	1.1	215	-5	4
32	316001245 (12D5CBDD)	0:00:31	-5.219260692596	119.500396728515	767	1.1	215	-5	4
33	316001245 (12D5CBDD)	0:00:32	-5.219260692596	119.500396728515	767	1.1	215	-5	4
34	316001245 (12D5CBDD)	0:00:33	-5.219260692596	119.500396728515	791	1.1	215	-5	4
35	316001245 (12D5CBDD)	0:00:34	-5.219276428222	119.500396728515	791	1.1	215	6	2
36	316001245 (12D5CBDD)	0:00:35	-5.219276428222	119.500396728515	791	1.2	226	7	2
37	316001245 (12D5CBDD)	0:00:36	-5.219276428222	119.500396728515	791	1.2	226	5	2
38	316001245 (12D5CBDD)	0:00:37	-5.219276428222	119.500396728515	791	1.2	226	0	2
39	316001245 (12D5CBDD)	0:00:38	-5.219276428222	119.500396728515	791	1.2	226	0	2
40	316001245 (12D5CBDD)	0:00:39	-5.219276428222	119.500396728515	791	1.2	226	0	2
41	316001245 (12D5CBDD)	0:00:40	-5.219276428222	119.500396728515	791	1.2	226	0	2
42	316001245 (12D5CBDD)	0:00:41	-5.219276428222	119.500396728515	791	1.2	226	0	2

43	316001245 (12D5CBDD)	0:00:42	-5.219287395477	119.500396728515	791	1.2	259	33	8
44	316001245 (12D5CBDD)	0:00:43	-5.219287395477	119.500396728515	791	1.2	259	32	8
45	316001245 (12D5CBDD)	0:00:44	-5.219287395477	119.500396728515	791	1.2	259	29	8
46	316001245 (12D5CBDD)	0:00:45	-5.219287395477	119.500396728515	791	1.2	259	28	8
47	316001245 (12D5CBDD)	0:00:46	-5.219287395477	119.500396728515	791	1.2	259	26	8
48	316001245 (12D5CBDD)	0:00:47	-5.219287395477	119.500396728515	791	1.2	259	23	8
49	316001245 (12D5CBDD)	0:00:48	-5.219287395477	119.500396728515	767	1.2	259	23	8
50	316001245 (12D5CBDD)	0:00:49	-5.219297885894	119.500389099121	767	1.2	259	26	6
51	316001245 (12D5CBDD)	0:00:50	-5.219297885894	119.500389099121	767	1.1	266	23	6
52	316001245 (12D5CBDD)	0:00:51	-5.219297885894	119.500389099121	767	1.1	266	23	6
53	316001245 (12D5CBDD)	0:00:52	-5.219297885894	119.500389099121	767	1.1	266	19	6
54	316001245 (12D5CBDD)	0:00:53	-5.219297885894	119.500389099121	767	1.1	266	18	6
55	316001245 (12D5CBDD)	0:00:54	-5.219297885894	119.500389099121	693	1.1	266	16	6
56	316001245 (12D5CBDD)	0:00:55	-5.219297885894	119.500389099121	693	1.1	266	14	6
57	316001245 (12D5CBDD)	0:00:56	-5.219297885894	119.500389099121	667	1.1	266	13	6
58	316001245 (12D5CBDD)	0:00:57	-5.219301700592	119.500381469726	655	0.7	270	13	5
59	316001245 (12D5CBDD)	0:00:58	-5.219301700592	119.500381469726	655	0.7	270	11	5
60	316001245 (12D5CBDD)	0:00:59	-5.219301700592	119.500381469726	655	0.7	270	9	5
61	316001245 (12D5CBDD)	0:01:00	-5.219301700592	119.500381469726	655	0.7	270	8	5
62	316001245 (12D5CBDD)	0:01:01	-5.219301700592	119.500381469726	655	0.7	270	5	5
63	316001245 (12D5CBDD)	0:01:02	-5.219301700592	119.500381469726	655	0.7	270	0	5
64	316001245 (12D5CBDD)	0:01:03	-5.219301700592	119.500381469726	655	0.7	270	0	5
65	316001245 (12D5CBDD)	0:01:04	-5.219301700592	119.500381469726	655	0.7	270	0	5
66	316001245 (12D5CBDD)	0:01:05	-5.219301700592	119.500381469726	673	0.7	270	0	5
67	316001245 (12D5CBDD)	0:01:06	-5.219301700592	119.500381469726	673	0.7	270	0	5
68	316001245 (12D5CBDD)	0:01:07	-5.219301700592	119.500381469726	673	0.7	270	0	5
69	316001245 (12D5CBDD)	0:01:08	-5.219303607940	119.500358581542	673	0.7	270	0	5
70	316001245 (12D5CBDD)	0:01:09	-5.219303607940	119.500358581542	673	0.8	272	0	5
71	316001245 (12D5CBDD)	0:01:10	-5.219303607940	119.500358581542	673	0.8	272	0	5
72	316001245 (12D5CBDD)	0:01:11	-5.219303607940	119.500358581542	673	0.8	272	0	5
73	316001245 (12D5CBDD)	0:01:12	-5.219303607940	119.500358581542	673	0.8	272	0	5
74	316001245 (12D5CBDD)	0:01:13	-5.219303607940	119.500358581542	673	0.8	272	-5	5
75	316001245 (12D5CBDD)	0:01:14	-5.219303607940	119.500358581542	673	0.8	272	-5	5
76	316001245 (12D5CBDD)	0:01:15	-5.219303607940	119.500358581542	673	0.8	272	-6	5
77	316001245 (12D5CBDD)	0:01:16	-5.219303607940	119.500358581542	693	0.8	272	-7	5
78	316001245 (12D5CBDD)	0:01:17	-5.219303607940	119.500358581542	693	0.8	272	-6	5
79	316001245 (12D5CBDD)	0:01:18	-5.219303607940	119.500358581542	702	0.8	272	-6	5
80	316001245 (12D5CBDD)	0:01:19	-5.219303607940	119.500358581542	731	0.8	272	-6	5
81	316001245 (12D5CBDD)	0:01:20	-5.219303607940	119.500320434570	731	1	308	35	8
82	316001245 (12D5CBDD)	0:01:21	-5.219303607940	119.500320434570	731	1	308	31	8
83	316001245 (12D5CBDD)	0:01:22	-5.219303607940	119.500320434570	731	1	308	30	8
84	316001245 (12D5CBDD)	0:01:23	-5.219303607940	119.500320434570	731	1	308	28	8
85	316001245 (12D5CBDD)	0:01:24	-5.219303607940	119.500320434570	731	1	308	25	8
86	316001245 (12D5CBDD)	0:01:25	-5.219303607940	119.500320434570	731	1	308	23	8
87	316001245 (12D5CBDD)	0:01:26	-5.219303607940	119.500320434570	731	1	308	20	8
88	316001245 (12D5CBDD)	0:01:27	-5.219303607940	119.500320434570	731	1	308	19	8
89	316001245 (12D5CBDD)	0:01:28	-5.219303607940	119.500320434570	731	1	308	17	8
90	316001245 (12D5CBDD)	0:01:29	-5.219303607940	119.500320434570	702	1	308	13	8
91	316001245 (12D5CBDD)	0:01:30	-5.219303607940	119.500320434570	702	1	308	12	8
92	316001245 (12D5CBDD)	0:01:31	-5.219301223754	119.500312805175	702	1	308	16	7
93	316001245 (12D5CBDD)	0:01:32	-5.219301223754	119.500312805175	673	0.8	314	12	7
94	316001245 (12D5CBDD)	0:01:33	-5.219301223754	119.500312805175	673	0.8	314	10	7
95	316001245 (12D5CBDD)	0:01:34	-5.219301223754	119.500312805175	673	0.8	314	10	7

96	316001245 (12D5CBDD)	0:01:35	-5.219301223754	119.500312805175	673	0.8	314	7	7
97	316001245 (12D5CBDD)	0:01:36	-5.219301223754	119.500312805175	673	0.8	314	6	7
98	316001245 (12D5CBDD)	0:01:37	-5.219301223754	119.500312805175	673	0.8	314	0	7
99	316001245 (12D5CBDD)	0:01:38	-5.219301223754	119.500312805175	673	0.8	314	0	7
100	316001245 (12D5CBDD)	0:01:39	-5.219301223754	119.500312805175	702	0.8	314	0	7
101	316001245 (12D5CBDD)	0:01:40	-5.219301223754	119.500312805175	702	0.8	314	0	7
102	316001245 (12D5CBDD)	0:01:41	-5.219301223754	119.500312805175	702	0.8	314	0	7
103	316001245 (12D5CBDD)	0:01:42	-5.219301223754	119.500312805175	731	0.8	314	0	7
104	316001245 (12D5CBDD)	0:01:43	-5.219292640686	119.500297546386	731	1	321	9	5
105	316001245 (12D5CBDD)	0:01:44	-5.219292640686	119.500297546386	731	1	321	8	5
106	316001245 (12D5CBDD)	0:01:45	-5.219292640686	119.500297546386	731	1	321	8	5
107	316001245 (12D5CBDD)	0:01:46	-5.219292640686	119.500297546386	731	1	321	10	5
108	316001245 (12D5CBDD)	0:01:47	-5.219292640686	119.500297546386	731	1	321	10	5
109	316001245 (12D5CBDD)	0:01:48	-5.219292640686	119.500297546386	731	1	321	10	5
110	316001245 (12D5CBDD)	0:01:49	-5.219292640686	119.500297546386	731	1	321	12	5
111	316001245 (12D5CBDD)	0:01:50	-5.219292640686	119.500297546386	731	1	321	10	5
112	316001245 (12D5CBDD)	0:01:51	-5.219292640686	119.500297546386	731	1	321	12	5
113	316001245 (12D5CBDD)	0:01:52	-5.219292640686	119.500297546386	731	1	321	13	5
114	316001245 (12D5CBDD)	0:01:53	-5.219292640686	119.500297546386	731	1	321	13	5
115	316001245 (12D5CBDD)	0:01:54	-5.219279766082	119.500282287597	731	1	321	8	3
116	316001245 (12D5CBDD)	0:01:55	-5.219279766082	119.500282287597	767	1.1	315	8	3
117	316001245 (12D5CBDD)	0:01:56	-5.219279766082	119.500282287597	767	1.1	315	9	3
118	316001245 (12D5CBDD)	0:01:57	-5.219279766082	119.500282287597	767	1.1	315	10	3
119	316001245 (12D5CBDD)	0:01:58	-5.219279766082	119.500282287597	767	1.1	315	10	3
120	316001245 (12D5CBDD)	0:01:59	-5.219279766082	119.500282287597	767	1.1	315	11	3
121	316001245 (12D5CBDD)	0:02:00	-5.219279766082	119.500282287597	767	1.1	315	11	3
122	316001245 (12D5CBDD)	0:02:01	-5.219279766082	119.500282287597	767	1.1	315	10	3
123	316001245 (12D5CBDD)	0:02:02	-5.219279766082	119.500282287597	767	1.1	315	9	3
124	316001245 (12D5CBDD)	0:02:03	-5.219279766082	119.500282287597	767	1.1	315	9	3
125	316001245 (12D5CBDD)	0:02:04	-5.219279766082	119.500282287597	767	1.1	315	9	3
126	316001245 (12D5CBDD)	0:02:05	-5.219279766082	119.500282287597	767	1.1	315	8	3
127	316001245 (12D5CBDD)	0:02:06	-5.219279766082	119.500282287597	767	1.1	315	6	3
128	316001245 (12D5CBDD)	0:02:07	-5.219279766082	119.500282287597	767	1.1	315	5	3
129	316001245 (12D5CBDD)	0:02:08	-5.219279766082	119.500282287597	767	1.1	315	0	3
130	316001245 (12D5CBDD)	0:02:09	-5.219279766082	119.500282287597	767	1.1	315	0	3
131	316001245 (12D5CBDD)	0:02:10	-5.219279766082	119.500282287597	767	1.1	315	0	3
132	316001245 (12D5CBDD)	0:02:11	-5.219279766082	119.500282287597	767	1.1	315	0	3
133	316001245 (12D5CBDD)	0:02:12	-5.219279766082	119.500282287597	767	1.1	315	0	3
134	316001245 (12D5CBDD)	0:02:13	-5.219279766082	119.500282287597	767	1.1	315	0	3
135	316001245 (12D5CBDD)	0:02:14	-5.219279766082	119.500282287597	767	1.1	315	5	3
136	316001245 (12D5CBDD)	0:02:15	-5.219279766082	119.500282287597	767	1.1	315	0	3
137	316001245 (12D5CBDD)	0:02:16	-5.219279766082	119.500282287597	767	1.1	315	0	3
138	316001245 (12D5CBDD)	0:02:17	-5.219254016876	119.500267028808	791	1.1	315	41	5
139	316001245 (12D5CBDD)	0:02:18	-5.219254016876	119.500267028808	791	1.2	351	43	5
140	316001245 (12D5CBDD)	0:02:19	-5.219254016876	119.500267028808	791	1.2	351	41	5
141	316001245 (12D5CBDD)	0:02:20	-5.219254016876	119.500267028808	791	1.2	351	41	5
142	316001245 (12D5CBDD)	0:02:21	-5.219248771667	119.500267028808	791	1.2	351	49	4
143	316001245 (12D5CBDD)	0:02:22	-5.219248771667	119.500267028808	791	1.2	0	48	4
144	316001245 (12D5CBDD)	0:02:23	-5.219248771667	119.500267028808	791	1.2	0	47	4
145	316001245 (12D5CBDD)	0:02:24	-5.219248771667	119.500267028808	791	1.2	0	46	4

146	316001245 (12D5CBDD)	0:02:25	-5.219248771667	119.500267028808	791	1.2	0	44	4
147	316001245 (12D5CBDD)	0:02:26	-5.219248771667	119.500267028808	791	1.2	0	40	4
148	316001245 (12D5CBDD)	0:02:27	-5.219248771667	119.500267028808	791	1.2	0	40	4
149	316001245 (12D5CBDD)	0:02:28	-5.219248771667	119.500267028808	791	1.2	0	37	4
150	316001245 (12D5CBDD)	0:02:29	-5.219236850738	119.500267028808	767	1.1	0	34	3
151	316001245 (12D5CBDD)	0:02:30	-5.219236850738	119.500267028808	767	1.1	0	33	3
152	316001245 (12D5CBDD)	0:02:31	-5.219236850738	119.500267028808	767	1.1	0	30	3
153	316001245 (12D5CBDD)	0:02:32	-5.219236850738	119.500267028808	767	1.1	0	27	3
154	316001245 (12D5CBDD)	0:02:33	-5.219236850738	119.500267028808	767	1.1	0	26	3
155	316001245 (12D5CBDD)	0:02:34	-5.219236850738	119.500267028808	767	1.1	0	21	3
156	316001245 (12D5CBDD)	0:02:35	-5.219236850738	119.500267028808	767	1.1	0	18	3
157	316001245 (12D5CBDD)	0:02:36	-5.219236850738	119.500267028808	767	1.1	0	17	3
158	316001245 (12D5CBDD)	0:02:37	-5.219236850738	119.500267028808	767	1.1	0	14	3
159	316001245 (12D5CBDD)	0:02:38	-5.219236850738	119.500267028808	767	1.1	0	9	3
160	316001245 (12D5CBDD)	0:02:39	-5.219236850738	119.500267028808	767	1.1	0	9	3
161	316001245 (12D5CBDD)	0:02:40	-5.219236850738	119.500267028808	767	1.1	0	7	3
162	316001245 (12D5CBDD)	0:02:41	-5.219236850738	119.500267028808	767	1.1	0	5	3
163	316001245 (12D5CBDD)	0:02:42	-5.219236850738	119.500267028808	767	1.1	0	0	3
164	316001245 (12D5CBDD)	0:02:43	-5.219236850738	119.500267028808	767	1.1	0	0	3
165	316001245 (12D5CBDD)	0:02:44	-5.219197750091	119.500267028808	731	1	60	-43	6
166	316001245 (12D5CBDD)	0:02:45	-5.219197750091	119.500267028808	702	0.9	52	-42	6
167	316001245 (12D5CBDD)	0:02:46	-5.219197750091	119.500267028808	702	0.9	52	-38	6
168	316001245 (12D5CBDD)	0:02:47	-5.219197750091	119.500267028808	702	0.9	52	-35	6
169	316001245 (12D5CBDD)	0:02:48	-5.219197750091	119.500267028808	702	0.9	52	-34	6
170	316001245 (12D5CBDD)	0:02:49	-5.219197750091	119.500267028808	702	0.9	52	-31	6
171	316001245 (12D5CBDD)	0:02:50	-5.219197750091	119.500267028808	702	0.9	52	-28	6
172	316001245 (12D5CBDD)	0:02:51	-5.219197750091	119.500267028808	702	0.9	52	-26	6
173	316001245 (12D5CBDD)	0:02:52	-5.219197750091	119.500267028808	702	0.9	52	-21	6
174	316001245 (12D5CBDD)	0:02:53	-5.219197750091	119.500267028808	702	0.9	52	-18	6
175	316001245 (12D5CBDD)	0:02:54	-5.219197750091	119.500267028808	702	0.9	52	-17	6
176	316001245 (12D5CBDD)	0:02:55	-5.219197750091	119.500267028808	702	0.9	52	-14	6
177	316001245 (12D5CBDD)	0:02:56	-5.219195842742	119.500267028808	702	0.9	48	-13	5
178	316001245 (12D5CBDD)	0:02:57	-5.219195842742	119.500267028808	702	0.9	48	-12	5
179	316001245 (12D5CBDD)	0:02:58	-5.219195842742	119.500267028808	702	0.9	48	-9	5
180	316001245 (12D5CBDD)	0:02:59	-5.219195842742	119.500267028808	702	0.9	48	-6	5
181	316001245 (12D5CBDD)	0:03:00	-5.219195842742	119.500267028808	702	0.9	48	-6	5
182	316001245 (12D5CBDD)	0:03:01	-5.219195842742	119.500267028808	702	0.9	48	0	5
183	316001245 (12D5CBDD)	0:03:02	-5.219195842742	119.500267028808	702	0.9	48	0	5
184	316001245 (12D5CBDD)	0:03:03	-5.219192981719	119.500267028808	702	0.9	48	-6	4
185	316001245 (12D5CBDD)	0:03:04	-5.219192981719	119.500267028808	702	0.8	45	-5	4
186	316001245 (12D5CBDD)	0:03:05	-5.219192981719	119.500267028808	702	0.8	45	0	4
187	316001245 (12D5CBDD)	0:03:06	-5.219192981719	119.500267028808	702	0.8	45	0	4
188	316001245 (12D5CBDD)	0:03:07	-5.219192981719	119.500267028808	702	0.8	45	-5	4
189	316001245 (12D5CBDD)	0:03:08	-5.219192981719	119.500267028808	702	0.9	45	0	4
190	316001245 (12D5CBDD)	0:03:09	-5.219192981719	119.500267028808	702	0.9	45	0	4
191	316001245 (12D5CBDD)	0:03:10	-5.219192981719	119.500267028808	702	0.9	45	0	4
192	316001245 (12D5CBDD)	0:03:11	-5.219192981719	119.500267028808	702	0.9	45	0	4
193	316001245 (12D5CBDD)	0:03:12	-5.219192981719	119.500267028808	702	0.9	45	-5	4
194	316001245 (12D5CBDD)	0:03:13	-5.219182491302	119.500267028808	702	0.9	63	6	4
195	316001245 (12D5CBDD)	0:03:14	-5.219182491302	119.500267028808	702	0.9	63	6	4
196	316001245 (12D5CBDD)	0:03:15	-5.219182491302	119.500267028808	702	0.9	63	0	4
197	316001245 (12D5CBDD)	0:03:16	-5.219182491302	119.500267028808	702	0.9	63	0	4
198	316001245 (12D5CBDD)	0:03:17	-5.219177722930	119.500267028808	702	0.9	68	8	4
199	316001245 (12D5CBDD)	0:03:18	-5.219177722930	119.500267028808	702	0.9	68	8	4
200	316001245 (12D5CBDD)	0:03:19	-5.219177722930	119.500267028808	702	0.9	68	6	4

201	316001245 (12D5CBDD)	0:03:20	-5.219177722930	119.500267028808	702	0.9	68	6	4
202	316001245 (12D5CBDD)	0:03:21	-5.219177722930	119.500267028808	767	0.9	68	7	4
203	316001245 (12D5CBDD)	0:03:22	-5.219177722930	119.500267028808	767	0.9	68	8	4
204	316001245 (12D5CBDD)	0:03:23	-5.219177722930	119.500267028808	767	0.9	68	7	4
205	316001245 (12D5CBDD)	0:03:24	-5.219177722930	119.500267028808	767	0.9	68	7	4
206	316001245 (12D5CBDD)	0:03:25	-5.219177722930	119.500267028808	767	0.9	68	6	4
207	316001245 (12D5CBDD)	0:03:26	-5.219177722930	119.500267028808	767	1	68	6	4
208	316001245 (12D5CBDD)	0:03:27	-5.219177722930	119.500267028808	767	1	68	6	4
209	316001245 (12D5CBDD)	0:03:28	-5.219168186187	119.500282287597	767	1	68	15	2
210	316001245 (12D5CBDD)	0:03:29	-5.219168186187	119.500282287597	791	1	79	16	2
211	316001245 (12D5CBDD)	0:03:30	-5.219168186187	119.500282287597	791	0.9	79	15	2
212	316001245 (12D5CBDD)	0:03:31	-5.219168186187	119.500282287597	791	0.9	79	15	2
213	316001245 (12D5CBDD)	0:03:32	-5.219163894653	119.500297546386	791	0.9	79	28	8
214	316001245 (12D5CBDD)	0:03:33	-5.219163894653	119.500297546386	791	0.9	95	26	8
215	316001245 (12D5CBDD)	0:03:34	-5.219163894653	119.500297546386	791	0.9	95	23	8
216	316001245 (12D5CBDD)	0:03:35	-5.219163894653	119.500297546386	791	0.9	95	21	8
217	316001245 (12D5CBDD)	0:03:36	-5.219163894653	119.500297546386	791	1.2	95	18	8
218	316001245 (12D5CBDD)	0:03:37	-5.219163894653	119.500297546386	791	1.2	95	14	8
219	316001245 (12D5CBDD)	0:03:38	-5.219163894653	119.500297546386	791	1.2	95	11	8
220	316001245 (12D5CBDD)	0:03:39	-5.219163894653	119.500297546386	791	1.2	95	8	8
221	316001245 (12D5CBDD)	0:03:40	-5.219158649444	119.500312805175	791	1.2	99	10	7
222	316001245 (12D5CBDD)	0:03:41	-5.219158649444	119.500312805175	791	1.2	99	9	7
223	316001245 (12D5CBDD)	0:03:42	-5.219158649444	119.500312805175	791	1.2	99	8	7
224	316001245 (12D5CBDD)	0:03:43	-5.219158649444	119.500312805175	791	1.2	99	7	7
225	316001245 (12D5CBDD)	0:03:44	-5.219157695770	119.500312805175	767	1.1	102	9	6
226	316001245 (12D5CBDD)	0:03:45	-5.219157695770	119.500312805175	767	1.1	102	7	6
227	316001245 (12D5CBDD)	0:03:46	-5.219157695770	119.500312805175	767	1.1	102	6	6
228	316001245 (12D5CBDD)	0:03:47	-5.219157695770	119.500312805175	767	1.1	102	0	6
229	316001245 (12D5CBDD)	0:03:48	-5.219157695770	119.500312805175	767	1.1	102	0	6
230	316001245 (12D5CBDD)	0:03:49	-5.219157695770	119.500312805175	767	1.1	102	0	6
231	316001245 (12D5CBDD)	0:03:50	-5.219157695770	119.500312805175	767	1.1	102	0	6
232	316001245 (12D5CBDD)	0:03:51	-5.219157695770	119.500312805175	767	1.1	102	0	6
233	316001245 (12D5CBDD)	0:03:52	-5.219157695770	119.500312805175	767	1.1	102	0	6
234	316001245 (12D5CBDD)	0:03:53	-5.219157695770	119.500312805175	767	1.1	102	5	6
235	316001245 (12D5CBDD)	0:03:54	-5.219157695770	119.500312805175	767	1.1	102	0	6
236	316001245 (12D5CBDD)	0:03:55	-5.219157218933	119.500320434570	767	1.1	102	8	5
237	316001245 (12D5CBDD)	0:03:56	-5.219157218933	119.500320434570	791	1.2	107	9	5
238	316001245 (12D5CBDD)	0:03:57	-5.219157218933	119.500320434570	791	1.2	107	10	5
239	316001245 (12D5CBDD)	0:03:58	-5.219157218933	119.500320434570	791	1.2	107	11	5
240	316001245 (12D5CBDD)	0:03:59	-5.219157218933	119.500320434570	791	1.2	107	9	5
241	316001245 (12D5CBDD)	0:04:00	-5.219157218933	119.500320434570	791	1.2	107	9	5
242	316001245 (12D5CBDD)	0:04:01	-5.219157218933	119.500320434570	791	1.2	107	10	5
243	316001245 (12D5CBDD)	0:04:02	-5.219157218933	119.500320434570	791	1.2	107	10	5
244	316001245 (12D5CBDD)	0:04:03	-5.219157218933	119.500328063964	791	1.2	114	18	3
245	316001245 (12D5CBDD)	0:04:04	-5.219157218933	119.500328063964	791	1.2	114	16	3
246	316001245 (12D5CBDD)	0:04:05	-5.219157218933	119.500328063964	791	1.2	114	15	3
247	316001245 (12D5CBDD)	0:04:06	-5.219157218933	119.500328063964	791	1.2	114	14	3
248	316001245 (12D5CBDD)	0:04:07	-5.219157695770	119.500350952148	791	1.2	120	18	2
249	316001245 (12D5CBDD)	0:04:08	-5.219157695770	119.500350952148	791	1.2	120	16	2
250	316001245 (12D5CBDD)	0:04:09	-5.219157695770	119.500350952148	791	1.2	120	15	2
251	316001245 (12D5CBDD)	0:04:10	-5.219157695770	119.500350952148	791	1.2	120	12	2
252	316001245 (12D5CBDD)	0:04:11	-5.219157695770	119.500350952148	791	1.2	120	9	2
253	316001245 (12D5CBDD)	0:04:12	-5.219157695770	119.500350952148	791	1.2	120	7	2
254	316001245 (12D5CBDD)	0:04:13	-5.219157695770	119.500350952148	791	1.2	120	6	2
255	316001245 (12D5CBDD)	0:04:14	-5.219157695770	119.500350952148	791	1.2	120	0	2

256	316001245 (12D5CBDD)	0:04:15	-5.219157695770	119.500350952148	791	1.2	120	0	2
257	316001245 (12D5CBDD)	0:04:16	-5.219157695770	119.500350952148	791	1.2	120	0	2
258	316001245 (12D5CBDD)	0:04:17	-5.219157695770	119.500350952148	791	1.2	120	0	2
259	316001245 (12D5CBDD)	0:04:18	-5.219157695770	119.500350952148	791	1.2	120	0	2
260	316001245 (12D5CBDD)	0:04:19	-5.219157695770	119.500350952148	791	1.2	120	0	2
261	316001245 (12D5CBDD)	0:04:20	-5.219157695770	119.500350952148	791	1.2	120	0	2
262	316001245 (12D5CBDD)	0:04:21	-5.219157695770	119.500350952148	791	1.2	120	6	2
263	316001245 (12D5CBDD)	0:04:22	-5.219157695770	119.500350952148	791	1.2	120	5	2
264	316001245 (12D5CBDD)	0:04:23	-5.219157695770	119.500350952148	791	1.2	120	7	2
265	316001245 (12D5CBDD)	0:04:24	-5.219157695770	119.500350952148	791	1.2	120	8	2
266	316001245 (12D5CBDD)	0:04:25	-5.219157695770	119.500350952148	791	1.2	120	8	2
267	316001245 (12D5CBDD)	0:04:26	-5.219166755676	119.500381469726	791	1.2	160	50	2
268	316001245 (12D5CBDD)	0:04:27	-5.219166755676	119.500381469726	791	1.2	160	49	2
269	316001245 (12D5CBDD)	0:04:28	-5.219166755676	119.500381469726	791	1.2	160	48	2
270	316001245 (12D5CBDD)	0:04:29	-5.219166755676	119.500381469726	791	1.2	160	46	2
271	316001245 (12D5CBDD)	0:04:30	-5.219168663024	119.500381469726	767	1.1	158	42	2
272	316001245 (12D5CBDD)	0:04:31	-5.219168663024	119.500381469726	767	1.1	158	39	2
273	316001245 (12D5CBDD)	0:04:32	-5.219168663024	119.500381469726	767	1.1	158	39	2
274	316001245 (12D5CBDD)	0:04:33	-5.219168663024	119.500381469726	767	1.1	158	36	2
275	316001245 (12D5CBDD)	0:04:34	-5.219168663024	119.500381469726	767	1.1	158	33	2
276	316001245 (12D5CBDD)	0:04:35	-5.219168663024	119.500381469726	0	0.6	158	0	2
277	316001245 (12D5CBDD)	0:04:36	-5.219168663024	119.500381469726	0	0.6	158	0	2

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No.	Returned MMSI	Waktu	Latitude	Longitude	RPM	SOG (kn)	COG (°)	Heading (°)	Distance to Target (m)
1	316001245 (12D5CBDD)	0:00:00	-5.219231605529	119.500427246093	0	0	195	199	12
2	316001245 (12D5CBDD)	0:00:01	-5.219231605529	119.500427246093	500	0.2	195	200	12
3	316001245 (12D5CBDD)	0:00:02	-5.219246864318	119.500427246093	531	0.3	197	200	11
4	316001245 (12D5CBDD)	0:00:03	-5.219246864318	119.500427246093	531	0.3	197	201	11
5	316001245 (12D5CBDD)	0:00:04	-5.219246864318	119.500427246093	731	1	197	201	11
6	316001245 (12D5CBDD)	0:00:05	-5.219260692596	119.500404357910	791	1.2	197	200	9
7	316001245 (12D5CBDD)	0:00:06	-5.219260692596	119.500404357910	767	1.1	195	199	9
8	316001245 (12D5CBDD)	0:00:07	-5.219260692596	119.500404357910	767	1.1	195	198	9
9	316001245 (12D5CBDD)	0:00:08	-5.219276428222	119.500404357910	791	1.1	199	197	7
10	316001245 (12D5CBDD)	0:00:09	-5.219276428222	119.500404357910	791	1.1	199	196	7
11	316001245 (12D5CBDD)	0:00:10	-5.219276428222	119.500404357910	791	1.2	199	198	7
12	316001245 (12D5CBDD)	0:00:11	-5.219305992126	119.500404357910	767	1.1	211	199	4
13	316001245 (12D5CBDD)	0:00:12	-5.219305992126	119.500404357910	767	1.1	211	200	4
14	316001245 (12D5CBDD)	0:00:13	-5.219312191009	119.500404357910	824	1.3	216	202	4
15	316001245 (12D5CBDD)	0:00:14	-5.219312191009	119.500404357910	767	1.1	216	223	4
16	316001245 (12D5CBDD)	0:00:15	-5.219312191009	119.500404357910	767	1.1	216	222	4
17	316001245 (12D5CBDD)	0:00:16	-5.219342708587	119.500396728515	791	1.2	298	221	24
18	316001245 (12D5CBDD)	0:00:17	-5.219342708587	119.500396728515	791	1.2	298	220	24
19	316001245 (12D5CBDD)	0:00:18	-5.219342708587	119.500396728515	791	1.2	298	222	24
20	316001245 (12D5CBDD)	0:00:19	-5.219347953796	119.500396728515	791	1.2	298	223	24
21	316001245 (12D5CBDD)	0:00:20	-5.219352722167	119.500389099121	767	1.1	301	236	23
22	316001245 (12D5CBDD)	0:00:21	-5.219352722167	119.500389099121	767	1.1	301	237	23
23	316001245 (12D5CBDD)	0:00:22	-5.219363689422	119.500358581542	767	1.1	301	287	22
24	316001245 (12D5CBDD)	0:00:23	-5.219363689422	119.500358581542	673	0.8	307	289	22
25	316001245 (12D5CBDD)	0:00:24	-5.219363689422	119.500358581542	673	0.8	309	306	21

26	316001245 (12D5CBDD)	0:00:25	-5.219363689422	119.500358581542	673	0.8	309	309	21
27	316001245 (12D5CBDD)	0:00:26	-5.219361305236	119.500350952148	673	0.8	309	311	20
28	316001245 (12D5CBDD)	0:00:27	-5.219361305236	119.500350952148	655	0.7	309	313	20
29	316001245 (12D5CBDD)	0:00:28	-5.219361305236	119.500350952148	655	0.7	309	314	20
30	316001245 (12D5CBDD)	0:00:29	-5.219361305236	119.500350952148	655	0.7	309	313	20
31	316001245 (12D5CBDD)	0:00:30	-5.219347000122	119.500328063964	731	1	309	312	18
32	316001245 (12D5CBDD)	0:00:31	-5.219347000122	119.500328063964	731	1	309	307	18
33	316001245 (12D5CBDD)	0:00:32	-5.219337463378	119.500320434570	767	1.1	308	307	17
34	316001245 (12D5CBDD)	0:00:33	-5.219334125518	119.500312805175	767	1.1	309	306	16
35	316001245 (12D5CBDD)	0:00:34	-5.219334125518	119.500312805175	767	1.1	309	307	16
36	316001245 (12D5CBDD)	0:00:35	-5.219316959381	119.500312805175	791	1.2	307	313	13
37	316001245 (12D5CBDD)	0:00:36	-5.219316959381	119.500312805175	791	1.2	307	313	13
38	316001245 (12D5CBDD)	0:00:37	-5.219295501708	119.500267028808	824	1.3	306	313	10
39	316001245 (12D5CBDD)	0:00:38	-5.219295501708	119.500267028808	824	1.3	306	313	10
40	316001245 (12D5CBDD)	0:00:39	-5.219291687011	119.500267028808	824	1.3	303	302	10
41	316001245 (12D5CBDD)	0:00:40	-5.219264984130	119.500244140625	824	1.3	298	302	5
42	316001245 (12D5CBDD)	0:00:41	-5.219264984130	119.500244140625	824	1.3	298	301	5
43	316001245 (12D5CBDD)	0:00:42	-5.219264984130	119.500244140625	824	1.3	298	303	5
44	316001245 (12D5CBDD)	0:00:43	-5.219232559204	119.500205993652	824	1.4	49	293	18
45	316001245 (12D5CBDD)	0:00:44	-5.219223022460	119.500183105468	791	1.2	55	334	19
46	316001245 (12D5CBDD)	0:00:45	-5.219213962554	119.500183105468	791	1.2	55	359	18
47	316001245 (12D5CBDD)	0:00:46	-5.219213962554	119.500183105468	731	1	57	66	18
48	316001245 (12D5CBDD)	0:00:47	-5.219190120697	119.500190734863	731	1	57	67	16
49	316001245 (12D5CBDD)	0:00:48	-5.219190120697	119.500190734863	673	0.8	64	66	16
50	316001245 (12D5CBDD)	0:00:49	-5.219190120697	119.500190734863	673	0.8	64	65	16
51	316001245 (12D5CBDD)	0:00:50	-5.219190120697	119.500190734863	673	0.8	64	64	16
52	316001245 (12D5CBDD)	0:00:51	-5.219190120697	119.500190734863	673	0.8	64	64	16
53	316001245 (12D5CBDD)	0:00:52	-5.219183921813	119.500205993652	673	0.8	64	62	15
54	316001245 (12D5CBDD)	0:00:53	-5.219183921813	119.500205993652	731	1	63	61	15
55	316001245 (12D5CBDD)	0:00:54	-5.219183921813	119.500205993652	731	1	63	60	15
56	316001245 (12D5CBDD)	0:00:55	-5.219182014465	119.500205993652	731	1	64	58	14
57	316001245 (12D5CBDD)	0:00:56	-5.219182014465	119.500205993652	731	1	64	60	14
58	316001245 (12D5CBDD)	0:00:57	-5.219182014465	119.500205993652	731	1	64	60	14
59	316001245 (12D5CBDD)	0:00:58	-5.219179153442	119.500205993652	767	1.1	65	57	14
60	316001245 (12D5CBDD)	0:00:59	-5.219179153442	119.500205993652	767	1.1	65	58	14
61	316001245 (12D5CBDD)	0:01:00	-5.219179153442	119.500205993652	767	1.1	65	60	14
62	316001245 (12D5CBDD)	0:01:01	-5.219179153442	119.500205993652	767	1.1	65	61	14
63	316001245 (12D5CBDD)	0:01:02	-5.219179153442	119.500205993652	767	1.1	65	65	14
64	316001245 (12D5CBDD)	0:01:03	-5.219179153442	119.500205993652	767	1.1	65	66	14
65	316001245 (12D5CBDD)	0:01:04	-5.219179153442	119.500205993652	767	1.1	65	68	14
66	316001245 (12D5CBDD)	0:01:05	-5.219171047210	119.500221252441	791	1.2	66	68	12
67	316001245 (12D5CBDD)	0:01:06	-5.219171047210	119.500221252441	791	1.2	66	69	12
68	316001245 (12D5CBDD)	0:01:07	-5.219171047210	119.500221252441	791	1.2	66	71	12
69	316001245 (12D5CBDD)	0:01:08	-5.219168186187	119.500228881835	791	1.2	66	70	12
70	316001245 (12D5CBDD)	0:01:09	-5.219168186187	119.500228881835	791	1.2	65	71	12
71	316001245 (12D5CBDD)	0:01:10	-5.219168186187	119.500228881835	791	1.2	65	70	12
72	316001245 (12D5CBDD)	0:01:11	-5.219168186187	119.500228881835	791	1.2	65	69	12
73	316001245 (12D5CBDD)	0:01:12	-5.219168186187	119.500228881835	791	1.2	65	71	12
74	316001245 (12D5CBDD)	0:01:13	-5.219162464141	119.500228881835	791	1.2	66	69	11
75	316001245 (12D5CBDD)	0:01:14	-5.219162464141	119.500228881835	791	1.2	66	66	11
76	316001245 (12D5CBDD)	0:01:15	-5.219162464141	119.500228881835	791	1.2	66	66	11
77	316001245 (12D5CBDD)	0:01:16	-5.219154357910	119.500251770019	791	1.2	66	64	9
78	316001245 (12D5CBDD)	0:01:17	-5.219154357910	119.500251770019	791	1.2	66	63	9
79	316001245 (12D5CBDD)	0:01:18	-5.219149589538	119.500267028808	824	1.3	66	68	7
80	316001245 (12D5CBDD)	0:01:19	-5.219149589538	119.500267028808	824	1.3	66	67	7

81	316001245 (12D5CBDD)	0:01:20	-5.219149589538	119.500267028808	824	1.3	66	68	7
82	316001245 (12D5CBDD)	0:01:21	-5.219145774841	119.500267028808	791	1.2	69	69	7
83	316001245 (12D5CBDD)	0:01:22	-5.219145774841	119.500267028808	791	1.2	69	70	7
84	316001245 (12D5CBDD)	0:01:23	-5.219145774841	119.500267028808	791	1.2	69	71	7
85	316001245 (12D5CBDD)	0:01:24	-5.219142913818	119.500267028808	824	1.3	68	74	6
86	316001245 (12D5CBDD)	0:01:25	-5.219142913818	119.500267028808	824	1.3	68	73	6
87	316001245 (12D5CBDD)	0:01:26	-5.219140529632	119.500282287597	791	1.2	68	73	5
88	316001245 (12D5CBDD)	0:01:27	-5.219140529632	119.500282287597	791	1.2	68	74	5
89	316001245 (12D5CBDD)	0:01:28	-5.219134807586	119.500297546386	824	1.3	72	68	4
90	316001245 (12D5CBDD)	0:01:29	-5.219134807586	119.500297546386	824	1.3	72	69	4
91	316001245 (12D5CBDD)	0:01:30	-5.219133853912	119.500312805175	824	1.3	72	67	3
92	316001245 (12D5CBDD)	0:01:31	-5.219133853912	119.500312805175	824	1.3	71	68	3
93	316001245 (12D5CBDD)	0:01:32	-5.219133853912	119.500312805175	824	1.3	71	66	3
94	316001245 (12D5CBDD)	0:01:33	-5.219133853912	119.500312805175	824	1.3	71	65	3
95	316001245 (12D5CBDD)	0:01:34	-5.219133853912	119.500312805175	824	1.3	71	65	3
96	316001245 (12D5CBDD)	0:01:35	-5.219133853912	119.500312805175	824	1.3	71	67	3
97	316001245 (12D5CBDD)	0:01:36	-5.219133853912	119.500312805175	824	1.3	71	66	3
98	316001245 (12D5CBDD)	0:01:37	-5.219133853912	119.500312805175	824	1.3	71	68	3
99	316001245 (12D5CBDD)	0:01:38	-5.219129085540	119.500312805175	824	1.3	307	69	17
100	316001245 (12D5CBDD)	0:01:39	-5.219129085540	119.500312805175	824	1.3	307	67	17
101	316001245 (12D5CBDD)	0:01:40	-5.219129085540	119.500312805175	824	1.3	307	66	17
102	316001245 (12D5CBDD)	0:01:41	-5.219129085540	119.500312805175	824	1.3	307	64	17
103	316001245 (12D5CBDD)	0:01:42	-5.219129085540	119.500312805175	824	1.3	307	62	17
104	316001245 (12D5CBDD)	0:01:43	-5.219129085540	119.500312805175	824	1.3	307	58	17
105	316001245 (12D5CBDD)	0:01:44	-5.219129085540	119.500312805175	824	1.3	307	56	17
106	316001245 (12D5CBDD)	0:01:45	-5.219123840332	119.500320434570	824	1.3	307	52	17
107	316001245 (12D5CBDD)	0:01:46	-5.219123840332	119.500320434570	791	1.2	304	49	17
108	316001245 (12D5CBDD)	0:01:47	-5.219123840332	119.500320434570	791	1.2	304	46	17
109	316001245 (12D5CBDD)	0:01:48	-5.219123840332	119.500320434570	791	1.2	304	42	17
110	316001245 (12D5CBDD)	0:01:49	-5.219118595123	119.500328063964	791	1.2	304	36	17
111	316001245 (12D5CBDD)	0:01:50	-5.219118595123	119.500328063964	791	1.2	301	33	17
112	316001245 (12D5CBDD)	0:01:51	-5.219100952148	119.500328063964	702	0.9	294	311	17
113	316001245 (12D5CBDD)	0:01:52	-5.219100952148	119.500328063964	702	0.9	294	312	17
114	316001245 (12D5CBDD)	0:01:53	-5.219100952148	119.500328063964	702	0.9	294	307	17
115	316001245 (12D5CBDD)	0:01:54	-5.219088554382	119.500328063964	702	0.9	294	306	17
116	316001245 (12D5CBDD)	0:01:55	-5.219088554382	119.500328063964	673	0.8	289	305	17
117	316001245 (12D5CBDD)	0:01:56	-5.219088554382	119.500328063964	673	0.8	289	302	17
118	316001245 (12D5CBDD)	0:01:57	-5.219088554382	119.500328063964	673	0.8	289	303	17
119	316001245 (12D5CBDD)	0:01:58	-5.219084739685	119.500328063964	673	0.8	289	301	16
120	316001245 (12D5CBDD)	0:01:59	-5.219084739685	119.500328063964	673	0.8	289	299	16
121	316001245 (12D5CBDD)	0:02:00	-5.219084739685	119.500328063964	673	0.8	289	297	16
122	316001245 (12D5CBDD)	0:02:01	-5.219084739685	119.500328063964	673	0.8	289	296	16
123	316001245 (12D5CBDD)	0:02:02	-5.219084739685	119.500328063964	673	0.8	289	295	16
124	316001245 (12D5CBDD)	0:02:03	-5.219084739685	119.500328063964	673	0.8	289	295	16
125	316001245 (12D5CBDD)	0:02:04	-5.219084739685	119.500328063964	673	0.8	289	291	16
126	316001245 (12D5CBDD)	0:02:05	-5.219084739685	119.500328063964	673	0.8	289	290	16
127	316001245 (12D5CBDD)	0:02:06	-5.219084739685	119.500328063964	673	0.8	289	289	16
128	316001245 (12D5CBDD)	0:02:07	-5.219079494476	119.500320434570	702	0.9	288	289	15
129	316001245 (12D5CBDD)	0:02:08	-5.219079494476	119.500320434570	702	0.9	288	289	15
130	316001245 (12D5CBDD)	0:02:09	-5.219079494476	119.500320434570	702	0.9	288	288	15
131	316001245 (12D5CBDD)	0:02:10	-5.219079494476	119.500320434570	702	0.9	288	289	15
132	316001245 (12D5CBDD)	0:02:11	-5.219079494476	119.500320434570	702	0.9	288	288	15
133	316001245 (12D5CBDD)	0:02:12	-5.219079494476	119.500320434570	702	0.9	288	288	15
134	316001245 (12D5CBDD)	0:02:13	-5.219079494476	119.500320434570	702	0.9	288	288	15
135	316001245 (12D5CBDD)	0:02:14	-5.219079494476	119.500320434570	702	0.9	288	290	15

136	316001245 (12D5CBDD)	0:02:15	-5.219079494476	119.500320434570	702	0.9	288	290	15
137	316001245 (12D5CBDD)	0:02:16	-5.219079494476	119.500320434570	702	0.9	288	289	15
138	316001245 (12D5CBDD)	0:02:17	-5.219079494476	119.500320434570	702	0.9	288	291	15
139	316001245 (12D5CBDD)	0:02:18	-5.219079494476	119.500320434570	702	0.9	288	290	15
140	316001245 (12D5CBDD)	0:02:19	-5.219079494476	119.500320434570	702	0.9	288	289	15
141	316001245 (12D5CBDD)	0:02:20	-5.219079494476	119.500320434570	702	0.9	288	289	15
142	316001245 (12D5CBDD)	0:02:21	-5.219079494476	119.500320434570	702	0.9	288	291	15
143	316001245 (12D5CBDD)	0:02:22	-5.219079494476	119.500320434570	702	0.9	288	291	15
144	316001245 (12D5CBDD)	0:02:23	-5.219079494476	119.500320434570	702	0.9	288	290	15
145	316001245 (12D5CBDD)	0:02:24	-5.219079494476	119.500320434570	702	0.9	288	291	15
146	316001245 (12D5CBDD)	0:02:25	-5.219079494476	119.500320434570	702	0.9	288	291	15
147	316001245 (12D5CBDD)	0:02:26	-5.219079494476	119.500320434570	702	0.9	288	292	15
148	316001245 (12D5CBDD)	0:02:27	-5.219079494476	119.500320434570	702	0.9	288	291	15
149	316001245 (12D5CBDD)	0:02:28	-5.219069480895	119.500312805175	702	0.9	288	293	12
150	316001245 (12D5CBDD)	0:02:29	-5.219069480895	119.500312805175	791	1.2	288	293	12
151	316001245 (12D5CBDD)	0:02:30	-5.219069480895	119.500312805175	791	1.2	288	293	12
152	316001245 (12D5CBDD)	0:02:31	-5.219069480895	119.500312805175	791	1.2	288	292	12
153	316001245 (12D5CBDD)	0:02:32	-5.219069480895	119.500312805175	791	1.2	288	292	12
154	316001245 (12D5CBDD)	0:02:33	-5.219069480895	119.500312805175	791	1.2	288	292	12
155	316001245 (12D5CBDD)	0:02:34	-5.219069480895	119.500312805175	791	1.2	288	291	12
156	316001245 (12D5CBDD)	0:02:35	-5.219069480895	119.500312805175	791	1.2	288	292	12
157	316001245 (12D5CBDD)	0:02:36	-5.219069480895	119.500312805175	791	1.2	288	290	12
158	316001245 (12D5CBDD)	0:02:37	-5.219069480895	119.500312805175	791	1.2	288	291	12
159	316001245 (12D5CBDD)	0:02:38	-5.219069480895	119.500312805175	791	1.2	288	290	12
160	316001245 (12D5CBDD)	0:02:39	-5.219069480895	119.500312805175	791	1.2	288	288	12
161	316001245 (12D5CBDD)	0:02:40	-5.219069480895	119.500312805175	791	1.2	288	290	12
162	316001245 (12D5CBDD)	0:02:41	-5.219069480895	119.500312805175	791	1.2	288	288	12
163	316001245 (12D5CBDD)	0:02:42	-5.219069480895	119.500312805175	791	1.2	288	288	12
164	316001245 (12D5CBDD)	0:02:43	-5.219069480895	119.500312805175	791	1.2	288	289	12
165	316001245 (12D5CBDD)	0:02:44	-5.219069480895	119.500312805175	791	1.2	288	286	12
166	316001245 (12D5CBDD)	0:02:45	-5.219069480895	119.500312805175	791	1.2	288	288	12
167	316001245 (12D5CBDD)	0:02:46	-5.219069480895	119.500312805175	791	1.2	288	287	12
168	316001245 (12D5CBDD)	0:02:47	-5.219069480895	119.500312805175	791	1.2	288	287	12
169	316001245 (12D5CBDD)	0:02:48	-5.219057083129	119.500267028808	824	1.3	285	285	8
170	316001245 (12D5CBDD)	0:02:49	-5.219057083129	119.500267028808	824	1.3	285	284	8
171	316001245 (12D5CBDD)	0:02:50	-5.219048976898	119.500244140625	824	1.3	283	280	6
172	316001245 (12D5CBDD)	0:02:51	-5.219048976898	119.500244140625	824	1.3	283	281	6
173	316001245 (12D5CBDD)	0:02:52	-5.219048976898	119.500244140625	824	1.3	283	282	6
174	316001245 (12D5CBDD)	0:02:53	-5.219046592712	119.500244140625	824	1.3	283	282	6
175	316001245 (12D5CBDD)	0:02:54	-5.219043254852	119.500228881835	824	1.3	282	285	4
176	316001245 (12D5CBDD)	0:02:55	-5.219043254852	119.500228881835	824	1.3	282	285	4
177	316001245 (12D5CBDD)	0:02:56	-5.219036579132	119.500205993652	824	1.3	282	286	12
178	316001245 (12D5CBDD)	0:02:57	-5.219031810760	119.500205993652	824	1.3	84	300	13
179	316001245 (12D5CBDD)	0:02:58	-5.219031810760	119.500205993652	824	1.3	87	305	13
180	316001245 (12D5CBDD)	0:02:59	-5.219017982482	119.500183105468	702	0.9	93	352	15
181	316001245 (12D5CBDD)	0:03:00	-5.219017982482	119.500183105468	702	0.9	93	10	15
182	316001245 (12D5CBDD)	0:03:01	-5.219017982482	119.500183105468	702	0.9	93	13	15
183	316001245 (12D5CBDD)	0:03:02	-5.218991756439	119.500205993652	655	0.7	105	113	14
184	316001245 (12D5CBDD)	0:03:03	-5.218991756439	119.500205993652	655	0.7	105	111	14
185	316001245 (12D5CBDD)	0:03:04	-5.218987941741	119.500221252441	702	0.9	109	107	12
186	316001245 (12D5CBDD)	0:03:05	-5.218987941741	119.500221252441	702	0.9	109	108	12
187	316001245 (12D5CBDD)	0:03:06	-5.218987941741	119.500228881835	731	1	112	106	10
188	316001245 (12D5CBDD)	0:03:07	-5.218987941741	119.500228881835	731	1	112	109	10
189	316001245 (12D5CBDD)	0:03:08	-5.218989849090	119.500244140625	731	1	112	110	9
190	316001245 (12D5CBDD)	0:03:09	-5.218989849090	119.500244140625	767	1.1	115	110	9

191	316001245 (12D5CBDD)	0:03:10	-5.218996047973	119.500267028808	767	1.1	117	122	6
192	316001245 (12D5CBDD)	0:03:11	-5.218996047973	119.500267028808	791	1.2	119	121	6
193	316001245 (12D5CBDD)	0:03:12	-5.219007492065	119.500312805175	824	1.3	131	115	3
194	316001245 (12D5CBDD)	0:03:13	-5.219007492065	119.500312805175	824	1.3	131	118	3
195	316001245 (12D5CBDD)	0:03:14	-5.219007492065	119.500312805175	824	1.3	131	124	3
196	316001245 (12D5CBDD)	0:03:15	-5.219010353088	119.500312805175	824	1.3	131	129	23
197	316001245 (12D5CBDD)	0:03:16	-5.219010353088	119.500312805175	791	1.2	153	136	23
198	316001245 (12D5CBDD)	0:03:17	-5.219024658203	119.500328063964	767	1.1	156	150	20
199	316001245 (12D5CBDD)	0:03:18	-5.219024658203	119.500328063964	767	1.1	156	154	20
200	316001245 (12D5CBDD)	0:03:19	-5.219059944152	119.500358581542	767	1.1	156	152	16
201	316001245 (12D5CBDD)	0:03:20	-5.219059944152	119.500358581542	824	1.3	161	158	16
202	316001245 (12D5CBDD)	0:03:21	-5.219063758850	119.500358581542	824	1.3	161	158	15
203	316001245 (12D5CBDD)	0:03:22	-5.219079494476	119.500358581542	791	1.2	162	162	13
204	316001245 (12D5CBDD)	0:03:23	-5.219079494476	119.500358581542	791	1.2	162	164	13
205	316001245 (12D5CBDD)	0:03:24	-5.219089984893	119.500381469726	824	1.3	164	163	12
206	316001245 (12D5CBDD)	0:03:25	-5.219089984893	119.500381469726	824	1.3	164	163	12
207	316001245 (12D5CBDD)	0:03:26	-5.219089984893	119.500381469726	824	1.3	164	160	12
208	316001245 (12D5CBDD)	0:03:27	-5.219089984893	119.500381469726	824	1.3	164	159	12
209	316001245 (12D5CBDD)	0:03:28	-5.219096660614	119.500389099121	824	1.3	167	159	11
210	316001245 (12D5CBDD)	0:03:29	-5.219112873077	119.500396728515	824	1.3	169	168	9
211	316001245 (12D5CBDD)	0:03:30	-5.219112873077	119.500396728515	824	1.3	169	168	9
212	316001245 (12D5CBDD)	0:03:31	-5.219118595123	119.500396728515	824	1.3	168	169	8
213	316001245 (12D5CBDD)	0:03:32	-5.219118595123	119.500396728515	824	1.3	168	171	8
214	316001245 (12D5CBDD)	0:03:33	-5.219142913818	119.500396728515	791	1.2	180	171	5
215	316001245 (12D5CBDD)	0:03:34	-5.219142913818	119.500396728515	791	1.2	180	170	5
216	316001245 (12D5CBDD)	0:03:35	-5.219171047210	119.500404357910	791	1.2	196	193	3
217	316001245 (12D5CBDD)	0:03:36	-5.219171047210	119.500404357910	791	1.2	196	195	3
218	316001245 (12D5CBDD)	0:03:37	-5.219226360321	119.500396728515	0	0.9	196	218	0
219	316001245 (12D5CBDD)	0:03:38	-5.219226360321	119.500396728515	0	0.6	166	217	0

Lampiran 7 Data hasil Autopilot Waypoint Circle Plotting Manual RC

No.	Returned MMSI	Waktu	Latitude	Longitude	RPM	SOG (kn)	COG (°)	Heading (°)	Distance to Target (m)
1	316001245 (12D5CBDD)	0:00:00	-5.219276428222	119.5003128052	0	0	221	224	6
2	316001245 (12D5CBDD)	0:00:01	-5.219276428222	119.5003128052	236	0	221	223	6
3	316001245 (12D5CBDD)	0:00:02	-5.219202995300	119.5004501343	459	0.1	221	199	16
4	316001245 (12D5CBDD)	0:00:03	-5.219202995300	119.5004501343	502	0.2	200	201	16
5	316001245 (12D5CBDD)	0:00:04	-5.219202995300	119.5004501343	502	0.2	200	199	16
6	316001245 (12D5CBDD)	0:00:05	-5.219202995300	119.5004501343	502	0.2	200	196	16
7	316001245 (12D5CBDD)	0:00:06	-5.219202995300	119.5004501343	723	0.2	200	197	16
8	316001245 (12D5CBDD)	0:00:07	-5.219225883483	119.5004348755	767	1.1	201	196	13
9	316001245 (12D5CBDD)	0:00:08	-5.219225883483	119.5004348755	767	1.1	201	197	13
10	316001245 (12D5CBDD)	0:00:09	-5.219238758087	119.5004272461	800	1.1	200	199	12
11	316001245 (12D5CBDD)	0:00:10	-5.219245433807	119.5004272461	824	1.3	201	200	11
12	316001245 (12D5CBDD)	0:00:11	-5.219245433807	119.5004272461	824	1.3	201	201	11
13	316001245 (12D5CBDD)	0:00:12	-5.219252586364	119.5004272461	791	1.2	202	201	10
14	316001245 (12D5CBDD)	0:00:13	-5.219252586364	119.5004272461	791	1.2	202	201	10
15	316001245 (12D5CBDD)	0:00:14	-5.219297885894	119.5004043579	791	1.2	207	212	5
16	316001245 (12D5CBDD)	0:00:15	-5.219297885894	119.5004043579	791	1.2	207	211	5
17	316001245 (12D5CBDD)	0:00:16	-5.219347000122	119.5003967285	824	1.3	279	210	6
18	316001245 (12D5CBDD)	0:00:17	-5.219347000122	119.5003967285	824	1.3	279	211	6
19	316001245 (12D5CBDD)	0:00:18	-5.219347000122	119.5003967285	824	1.3	279	221	6
20	316001245 (12D5CBDD)	0:00:19	-5.219365596771	119.5003967285	767	1.1	298	235	6

21	316001245 (12D5CBDD)	0:00:20	-5.219374656677	119.5003890991	767	1.1	307	258	6
22	316001245 (12D5CBDD)	0:00:21	-5.219377994537	119.5003814697	702	0.9	317	261	6
23	316001245 (12D5CBDD)	0:00:22	-5.219381809234	119.5003814697	702	0.9	317	273	6
24	316001245 (12D5CBDD)	0:00:23	-5.219381809234	119.5003814697	673	0.8	320	288	6
25	316001245 (12D5CBDD)	0:00:24	-5.219381809234	119.5003585815	655	0.7	333	297	5
26	316001245 (12D5CBDD)	0:00:25	-5.219380855560	119.5003585815	655	0.7	333	298	5
27	316001245 (12D5CBDD)	0:00:26	-5.219380855560	119.5003585815	655	0.7	333	306	5
28	316001245 (12D5CBDD)	0:00:27	-5.219377994537	119.5003585815	621	0.6	339	340	4
29	316001245 (12D5CBDD)	0:00:28	-5.219377994537	119.5003585815	621	0.6	339	341	4
30	316001245 (12D5CBDD)	0:00:29	-5.219368934631	119.5003509521	621	0.6	339	341	3
31	316001245 (12D5CBDD)	0:00:30	-5.219368934631	119.5003509521	621	0.6	346	346	3
32	316001245 (12D5CBDD)	0:00:31	-5.219368934631	119.5003509521	621	0.6	346	346	3
33	316001245 (12D5CBDD)	0:00:32	-5.219368934631	119.5003509521	621	0.6	346	343	3
34	316001245 (12D5CBDD)	0:00:33	-5.219368934631	119.5003509521	621	0.6	346	346	3
35	316001245 (12D5CBDD)	0:00:34	-5.219368934631	119.5003509521	700	0.6	346	348	3
36	316001245 (12D5CBDD)	0:00:35	-5.219359397888	119.5003509521	731	1	342	349	2
37	316001245 (12D5CBDD)	0:00:36	-5.219359397888	119.5003509521	731	1	342	349	2
38	316001245 (12D5CBDD)	0:00:37	-5.219359397888	119.5003509521	731	1	342	350	2
39	316001245 (12D5CBDD)	0:00:38	-5.219356060028	119.5003509521	702	0.9	338	348	2
40	316001245 (12D5CBDD)	0:00:39	-5.219356060028	119.5003509521	702	0.9	338	349	2
41	316001245 (12D5CBDD)	0:00:40	-5.219350337982	119.5003509521	702	0.9	338	346	9
42	316001245 (12D5CBDD)	0:00:41	-5.219350337982	119.5003509521	702	0.9	292	344	9
43	316001245 (12D5CBDD)	0:00:42	-5.219350337982	119.5003509521	702	0.9	292	298	9
44	316001245 (12D5CBDD)	0:00:43	-5.219350337982	119.5003509521	702	0.9	292	298	9
45	316001245 (12D5CBDD)	0:00:44	-5.219323635101	119.5003280640	702	0.9	272	297	6
46	316001245 (12D5CBDD)	0:00:45	-5.219323635101	119.5003280640	702	0.9	272	294	6
47	316001245 (12D5CBDD)	0:00:46	-5.219323635101	119.5003280640	702	0.9	272	292	6
48	316001245 (12D5CBDD)	0:00:47	-5.219323635101	119.5003280640	702	0.9	272	291	6
49	316001245 (12D5CBDD)	0:00:48	-5.219323635101	119.5003280640	702	0.9	272	288	6
50	316001245 (12D5CBDD)	0:00:49	-5.219317436218	119.5003204346	702	0.9	272	284	5
51	316001245 (12D5CBDD)	0:00:50	-5.219317436218	119.5003204346	702	0.9	267	267	5
52	316001245 (12D5CBDD)	0:00:51	-5.219314575195	119.5003128052	767	1.1	260	267	3
53	316001245 (12D5CBDD)	0:00:52	-5.219314575195	119.5003128052	767	1.1	260	266	3
54	316001245 (12D5CBDD)	0:00:53	-5.219314575195	119.5003128052	767	1.1	260	266	3
55	316001245 (12D5CBDD)	0:00:54	-5.219315528869	119.5002670288	791	1.2	302	287	7
56	316001245 (12D5CBDD)	0:00:55	-5.219315528869	119.5002670288	791	1.2	302	291	7
57	316001245 (12D5CBDD)	0:00:56	-5.219318866729	119.5002441406	702	0.9	324	294	5
58	316001245 (12D5CBDD)	0:00:57	-5.219318866729	119.5002441406	702	0.9	324	300	5
59	316001245 (12D5CBDD)	0:00:58	-5.219318866729	119.5002441406	702	0.9	324	306	5
60	316001245 (12D5CBDD)	0:00:59	-5.219315528869	119.5002288818	702	0.9	324	315	4
61	316001245 (12D5CBDD)	0:01:00	-5.219315528869	119.5002288818	673	0.8	329	316	4
62	316001245 (12D5CBDD)	0:01:01	-5.219315528869	119.5002288818	673	0.8	329	319	4
63	316001245 (12D5CBDD)	0:01:02	-5.219315528869	119.5002288818	673	0.8	329	321	4
64	316001245 (12D5CBDD)	0:01:03	-5.219315528869	119.5002288818	673	0.8	329	334	4
65	316001245 (12D5CBDD)	0:01:04	-5.219315528869	119.5002288818	673	0.8	329	333	4
66	316001245 (12D5CBDD)	0:01:05	-5.219291687011	119.5002288818	700	0.8	329	334	2
67	316001245 (12D5CBDD)	0:01:06	-5.219291687011	119.5002288818	731	1	313	332	2
68	316001245 (12D5CBDD)	0:01:07	-5.219286918640	119.5002212524	731	1	313	328	9
69	316001245 (12D5CBDD)	0:01:08	-5.219286918640	119.5002212524	731	1	344	326	9
70	316001245 (12D5CBDD)	0:01:09	-5.219271659851	119.5002212524	731	1	341	347	7
71	316001245 (12D5CBDD)	0:01:10	-5.219271659851	119.5002212524	731	1	341	348	7
72	316001245 (12D5CBDD)	0:01:11	-5.219271659851	119.5002212524	731	1	341	348	7
73	316001245 (12D5CBDD)	0:01:12	-5.219271659851	119.5002212524	731	1	341	347	7
74	316001245 (12D5CBDD)	0:01:13	-5.219254493713	119.5002212524	731	1	341	346	5
75	316001245 (12D5CBDD)	0:01:14	-5.219254493713	119.5002212524	767	1.1	342	345	5

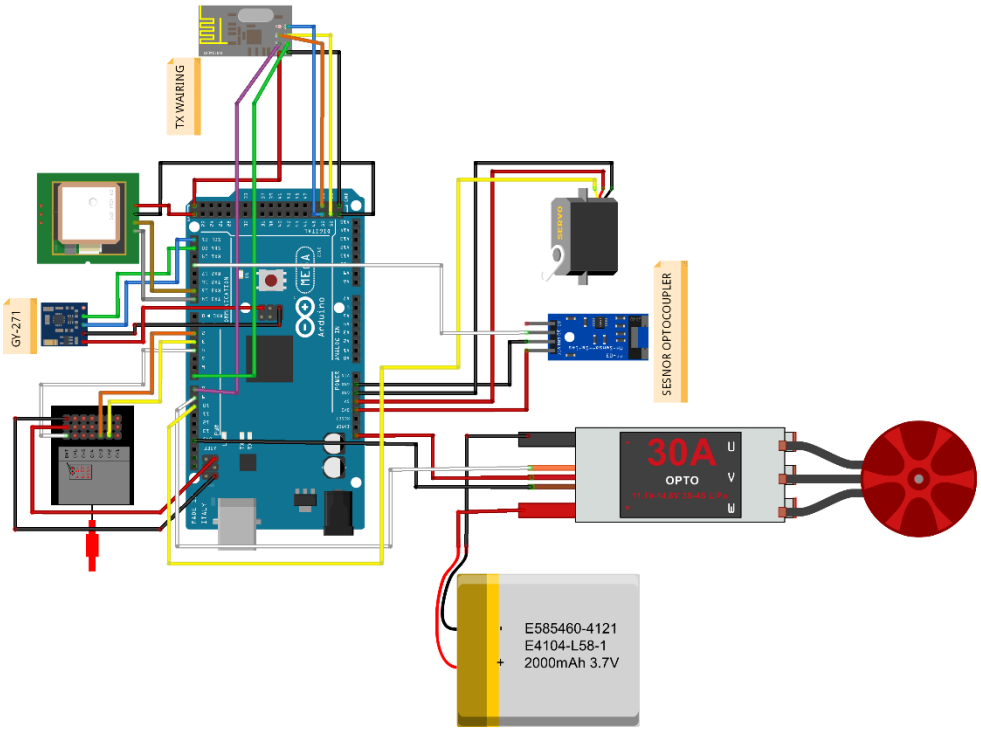
76	316001245 (12D5CBDD)	0:01:15	-5.219254493713	119.5002212524	767	1.1	342	338	5
77	316001245 (12D5CBDD)	0:01:16	-5.219254493713	119.5002212524	767	1.1	342	340	5
78	316001245 (12D5CBDD)	0:01:17	-5.219236850738	119.5002212524	791	1.2	335	339	4
79	316001245 (12D5CBDD)	0:01:18	-5.219236850738	119.5002212524	791	1.2	335	340	4
80	316001245 (12D5CBDD)	0:01:19	-5.219236850738	119.5002212524	791	1.2	335	339	4
81	316001245 (12D5CBDD)	0:01:20	-5.219230651855	119.5002212524	791	1.2	335	338	3
82	316001245 (12D5CBDD)	0:01:21	-5.219230651855	119.5002212524	791	1.2	329	323	3
83	316001245 (12D5CBDD)	0:01:22	-5.219230651855	119.5002212524	791	1.2	329	322	3
84	316001245 (12D5CBDD)	0:01:23	-5.219230651855	119.5002212524	791	1.2	329	324	3
85	316001245 (12D5CBDD)	0:01:24	-5.219201087951	119.5002059937	791	1.2	329	325	7
86	316001245 (12D5CBDD)	0:01:25	-5.219201087951	119.5002059937	791	1.2	25	327	7
87	316001245 (12D5CBDD)	0:01:26	-5.219194889068	119.5002059937	791	1.2	27	332	7
88	316001245 (12D5CBDD)	0:01:27	-5.219194889068	119.5002059937	791	1.2	27	338	7
89	316001245 (12D5CBDD)	0:01:28	-5.219190120697	119.5002059937	767	1.1	30	347	6
90	316001245 (12D5CBDD)	0:01:29	-5.219190120697	119.5002059937	767	1.1	30	358	6
91	316001245 (12D5CBDD)	0:01:30	-5.219190120697	119.5002059937	767	1.1	30	6	6
92	316001245 (12D5CBDD)	0:01:31	-5.219190120697	119.5002059937	767	1.1	30	21	6
93	316001245 (12D5CBDD)	0:01:32	-5.219168663024	119.5002059937	767	1.1	30	30	4
94	316001245 (12D5CBDD)	0:01:33	-5.219168663024	119.5002059937	673	0.8	43	36	4
95	316001245 (12D5CBDD)	0:01:34	-5.219168663024	119.5002059937	673	0.8	43	41	4
96	316001245 (12D5CBDD)	0:01:35	-5.219161987304	119.5002059937	673	0.8	51	54	4
97	316001245 (12D5CBDD)	0:01:36	-5.219161987304	119.5002059937	673	0.8	51	53	4
98	316001245 (12D5CBDD)	0:01:37	-5.219161987304	119.5002059937	673	0.8	51	53	4
99	316001245 (12D5CBDD)	0:01:38	-5.219154357910	119.5002212524	702	0.9	51	53	3
100	316001245 (12D5CBDD)	0:01:39	-5.219154357910	119.5002212524	702	0.9	51	52	3
101	316001245 (12D5CBDD)	0:01:40	-5.219154357910	119.5002212524	702	0.9	51	49	3
102	316001245 (12D5CBDD)	0:01:41	-5.219142913818	119.5002288818	767	1.1	65	51	10
103	316001245 (12D5CBDD)	0:01:42	-5.219142913818	119.5002288818	767	1.1	65	50	10
104	316001245 (12D5CBDD)	0:01:43	-5.219142913818	119.5002288818	767	1.1	65	58	10
105	316001245 (12D5CBDD)	0:01:44	-5.219135761260	119.5002288818	767	1.1	65	61	9
106	316001245 (12D5CBDD)	0:01:45	-5.219135761260	119.5002288818	767	1.1	67	64	9
107	316001245 (12D5CBDD)	0:01:46	-5.219135761260	119.5002288818	767	1.1	67	68	9
108	316001245 (12D5CBDD)	0:01:47	-5.219135761260	119.5002288818	767	1.1	67	70	9
109	316001245 (12D5CBDD)	0:01:48	-5.219132423400	119.5002441406	767	1.1	67	71	8
110	316001245 (12D5CBDD)	0:01:49	-5.219132423400	119.5002441406	767	1.1	67	72	8
111	316001245 (12D5CBDD)	0:01:50	-5.219132423400	119.5002441406	767	1.1	67	74	8
112	316001245 (12D5CBDD)	0:01:51	-5.219130516052	119.5002517700	767	1.1	67	74	7
113	316001245 (12D5CBDD)	0:01:52	-5.219130516052	119.5002517700	767	1.1	67	73	7
114	316001245 (12D5CBDD)	0:01:53	-5.219130516052	119.5002517700	767	1.1	67	73	7
115	316001245 (12D5CBDD)	0:01:54	-5.219125747680	119.5002670288	767	1.1	68	71	6
116	316001245 (12D5CBDD)	0:01:55	-5.219125747680	119.5002670288	767	1.1	68	70	6
117	316001245 (12D5CBDD)	0:01:56	-5.219125747680	119.5002670288	767	1.1	68	69	6
118	316001245 (12D5CBDD)	0:01:57	-5.219125747680	119.5002670288	767	1.1	68	70	6
119	316001245 (12D5CBDD)	0:01:58	-5.219125747680	119.5002670288	767	1.1	68	69	6
120	316001245 (12D5CBDD)	0:01:59	-5.219125747680	119.5002670288	767	1.1	68	67	6
121	316001245 (12D5CBDD)	0:02:00	-5.219125747680	119.5002670288	767	1.1	68	66	6
122	316001245 (12D5CBDD)	0:02:01	-5.219112873077	119.5002975464	791	1.2	72	68	2
123	316001245 (12D5CBDD)	0:02:02	-5.219112873077	119.5002975464	791	1.2	72	67	2
124	316001245 (12D5CBDD)	0:02:03	-5.219112873077	119.5002975464	791	1.2	72	67	2
125	316001245 (12D5CBDD)	0:02:04	-5.219112873077	119.5002975464	791	1.2	72	71	2
126	316001245 (12D5CBDD)	0:02:05	-5.219110012054	119.5003128052	791	1.2	104	69	9
127	316001245 (12D5CBDD)	0:02:06	-5.219110012054	119.5003128052	791	1.2	104	73	9
128	316001245 (12D5CBDD)	0:02:07	-5.219110012054	119.5003128052	791	1.2	104	73	9
129	316001245 (12D5CBDD)	0:02:08	-5.219107151031	119.5003128052	791	1.2	104	77	8
130	316001245 (12D5CBDD)	0:02:09	-5.219107151031	119.5003128052	824	1.3	108	84	8

131	316001245 (12D5CBDD)	0:02:10	-5.219107151031	119.5003128052	824	1.3	108	88	8
132	316001245 (12D5CBDD)	0:02:11	-5.219102859497	119.5003204346	731	1	115	113	7
133	316001245 (12D5CBDD)	0:02:12	-5.219102859497	119.5003204346	731	1	115	115	7
134	316001245 (12D5CBDD)	0:02:13	-5.219102859497	119.5003204346	731	1	115	119	7
135	316001245 (12D5CBDD)	0:02:14	-5.219103813171	119.5003204346	731	1	115	119	7
136	316001245 (12D5CBDD)	0:02:15	-5.219103813171	119.5003204346	731	1	115	118	7
137	316001245 (12D5CBDD)	0:02:16	-5.219104290008	119.5003280640	731	1	115	122	6
138	316001245 (12D5CBDD)	0:02:17	-5.219104290008	119.5003280640	767	1.1	117	121	6
139	316001245 (12D5CBDD)	0:02:18	-5.219104290008	119.5003280640	767	1.1	117	121	6
140	316001245 (12D5CBDD)	0:02:19	-5.219110488891	119.5003509521	791	1.2	119	113	4
141	316001245 (12D5CBDD)	0:02:20	-5.219110488891	119.5003509521	791	1.2	119	114	4
142	316001245 (12D5CBDD)	0:02:21	-5.219110488891	119.5003509521	791	1.2	119	116	4
143	316001245 (12D5CBDD)	0:02:22	-5.219110488891	119.5003509521	791	1.2	119	118	4
144	316001245 (12D5CBDD)	0:02:23	-5.219110488891	119.5003509521	791	1.2	119	116	4
145	316001245 (12D5CBDD)	0:02:24	-5.219122886657	119.5003814697	791	1.2	157	121	8
146	316001245 (12D5CBDD)	0:02:25	-5.219124794006	119.5003890991	791	1.2	162	124	8
147	316001245 (12D5CBDD)	0:02:26	-5.219124794006	119.5003890991	791	1.2	162	129	8
148	316001245 (12D5CBDD)	0:02:27	-5.219124794006	119.5003890991	791	1.2	162	143	8
149	316001245 (12D5CBDD)	0:02:28	-5.219124794006	119.5003890991	791	1.2	162	147	8
150	316001245 (12D5CBDD)	0:02:29	-5.219124794006	119.5003890991	791	1.2	162	152	8
151	316001245 (12D5CBDD)	0:02:30	-5.219130516052	119.5003967285	791	1.2	162	155	7
152	316001245 (12D5CBDD)	0:02:31	-5.219130516052	119.5003967285	702	0.9	173	156	7
153	316001245 (12D5CBDD)	0:02:32	-5.219138622283	119.5003967285	702	0.9	180	185	6
154	316001245 (12D5CBDD)	0:02:33	-5.219138622283	119.5003967285	702	0.9	180	186	6
155	316001245 (12D5CBDD)	0:02:34	-5.219138622283	119.5003967285	702	0.9	180	186	6
156	316001245 (12D5CBDD)	0:02:35	-5.219138622283	119.5003967285	702	0.9	180	184	6
157	316001245 (12D5CBDD)	0:02:36	-5.219129085540	119.5003967285	702	0.9	180	188	7
158	316001245 (12D5CBDD)	0:02:37	-5.219129085540	119.5003967285	702	0.9	173	178	7
159	316001245 (12D5CBDD)	0:02:38	-5.219129085540	119.5003967285	702	0.9	173	177	7
160	316001245 (12D5CBDD)	0:02:39	-5.219129085540	119.5003967285	702	0.9	173	177	7
161	316001245 (12D5CBDD)	0:02:40	-5.219143390655	119.5003967285	673	0.8	171	173	5
162	316001245 (12D5CBDD)	0:02:41	-5.219143390655	119.5003967285	673	0.8	171	172	5
163	316001245 (12D5CBDD)	0:02:42	-5.219143390655	119.5003967285	673	0.8	171	171	5
164	316001245 (12D5CBDD)	0:02:43	-5.219143390655	119.5003967285	673	0.8	171	169	5
165	316001245 (12D5CBDD)	0:02:44	-5.219143390655	119.5003967285	673	0.8	171	169	5
166	316001245 (12D5CBDD)	0:02:45	-5.219161987304	119.5003967285	673	0.8	171	168	4
167	316001245 (12D5CBDD)	0:02:46	-5.219161987304	119.5003967285	791	1.2	180	166	4
168	316001245 (12D5CBDD)	0:02:47	-5.219161987304	119.5003967285	791	1.2	180	167	4
169	316001245 (12D5CBDD)	0:02:48	-5.219161987304	119.5003967285	791	1.2	180	167	4
170	316001245 (12D5CBDD)	0:02:49	-5.219168186187	119.5004043579	791	1.2	180	167	3
171	316001245 (12D5CBDD)	0:02:50	-5.219168186187	119.5004043579	791	1.2	194	172	3
172	316001245 (12D5CBDD)	0:02:51	-5.219168186187	119.5004043579	791	1.2	194	173	3
173	316001245 (12D5CBDD)	0:02:52	-5.219168186187	119.5004043579	791	1.2	194	178	3
174	316001245 (12D5CBDD)	0:02:53	-5.219168186187	119.5004043579	791	1.2	194	179	3
175	316001245 (12D5CBDD)	0:02:54	-5.219168186187	119.5004043579	791	1.2	194	179	3
176	316001245 (12D5CBDD)	0:02:55	-5.219168186187	119.5004043579	791	1.2	194	183	3
177	316001245 (12D5CBDD)	0:02:56	-5.219180583953	119.5004272461	767	1.1	220	186	2
178	316001245 (12D5CBDD)	0:02:57	-5.219180583953	119.5004272461	767	1.1	220	189	2
179	316001245 (12D5CBDD)	0:02:58	-5.219180583953	119.5004272461	767	1.1	220	194	2
180	316001245 (12D5CBDD)	0:02:59	-5.219185829162	119.5004272461	731	1	231	201	2
181	316001245 (12D5CBDD)	0:03:00	-5.219185829162	119.5004272461	731	1	231	203	2
182	316001245 (12D5CBDD)	0:03:01	-5.219185829162	119.5004272461	731	1	231	208	2
183	316001245 (12D5CBDD)	0:03:02	-5.219199657440	119.5004272461	0	0.7	166	234	0
184	316001245 (12D5CBDD)	0:03:03	-5.219213962554	119.5004043579	0	0.5	166	234	0

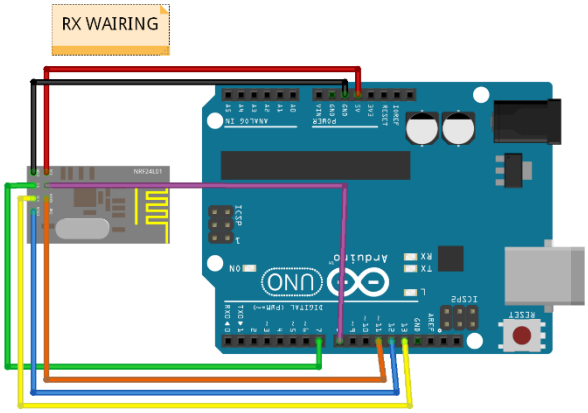
LAMPIRAN RANGKAIAN SKEMATIK

Full rangkaian skematik

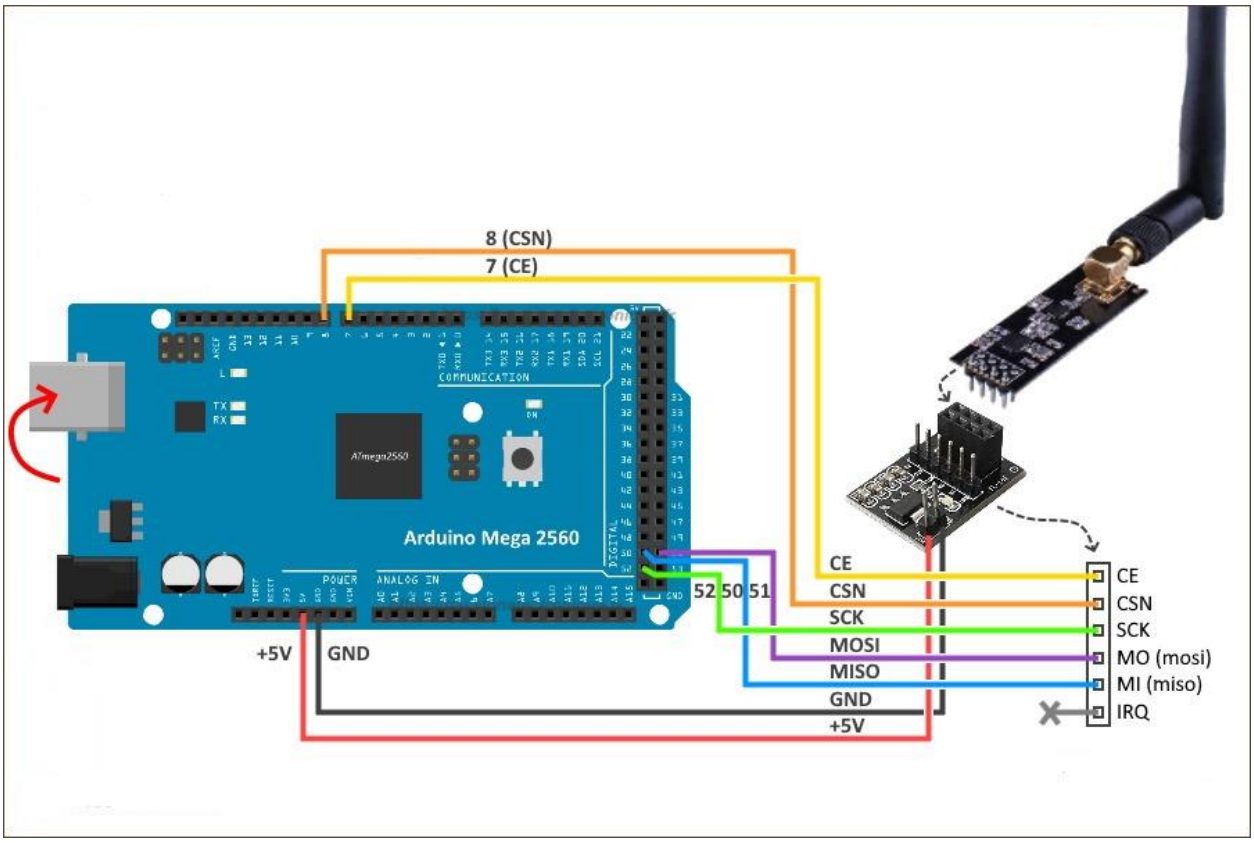
Lampiran 8 TX skematik (Prototype)



Lampiran 9 RX skematik (Ground Station)



Lampiran 10 Arduino to NRF24L01



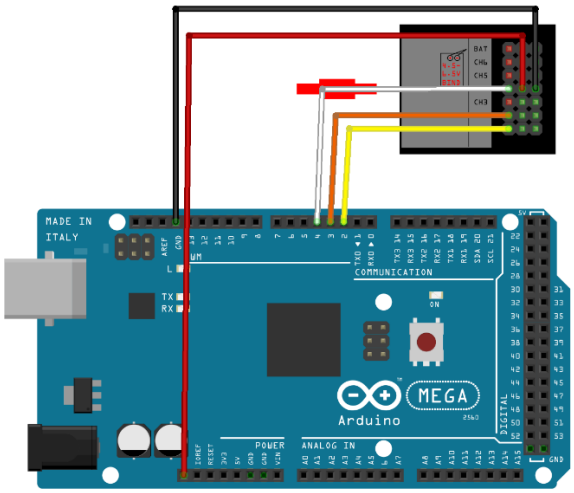
TX wairing

8. CE = Pin 7 Arduino Mega2560
9. CSN = Pin 8 Arduino Mega2560
10. MISO = Pin 50 Arduino Mega2560
11. MOSI = Pin 51 Arduino Mega2560
12. SCK = Pin 52 Arduino Mega2560
13. GND = Pin GND Arduino Mega2560
14. VCC = Pin 5V Arduino Mega2560

RX Wairing

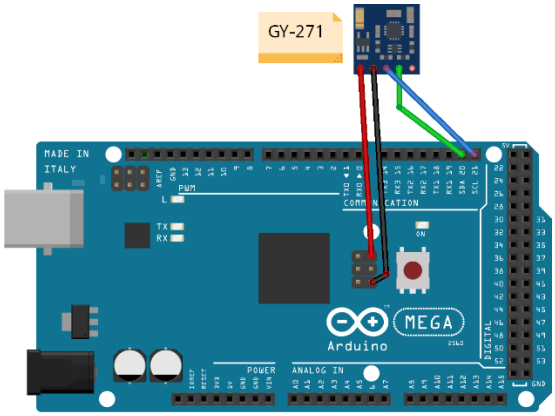
15. CE = Pin 7 Arduino UNO
16. CSN = Pin 8 Arduino UNO
17. MOSI = Pin 11 Arduino UNO
18. MISO = Pin 12 Arduino UNO
19. SCK = Pin 13 Arduino UNO
20. GND = Pin GND Arduino UNO
21. VCC = Pin 5V Arduino UNO

Lampiran 11 Arduino to Receiver



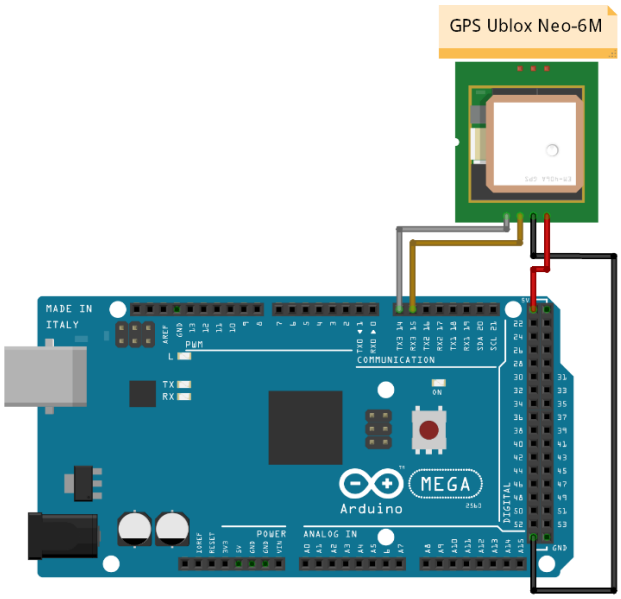
22. Data Receiver(Mux Pin) = Pin 4 Arduino Mega2560
23. Channel 2 (Throtle) = Pin 3 Arduino Mega2560
24. Channel 1 (Servo) = Pin 2 Arduino Mega2560
25. GND = Pin GND Arduino Mega2560
26. VCC = Pin 5V Arduino Mega2560

Lampiran 12 Arduino to GY-271



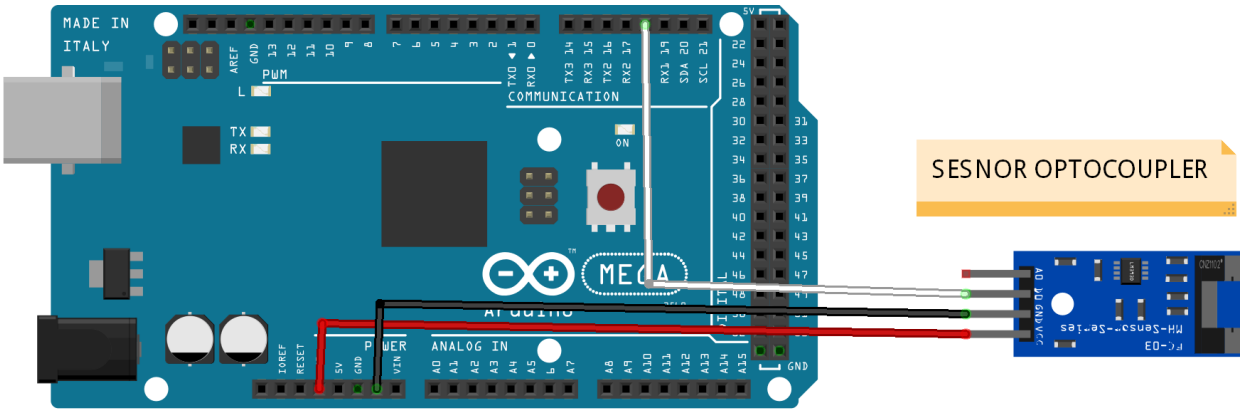
27. SDA GY-271 = Pin 20 Arduino Mega2560
28. SCL GY-271 = Pin 21 Arduino Mega2560
29. GND = Pin GND Arduino Mega2560
30. VCC = Pin 5V Arduino Mega2560

Lampiran 13 Arduino to GPS Ublox Neo-6M



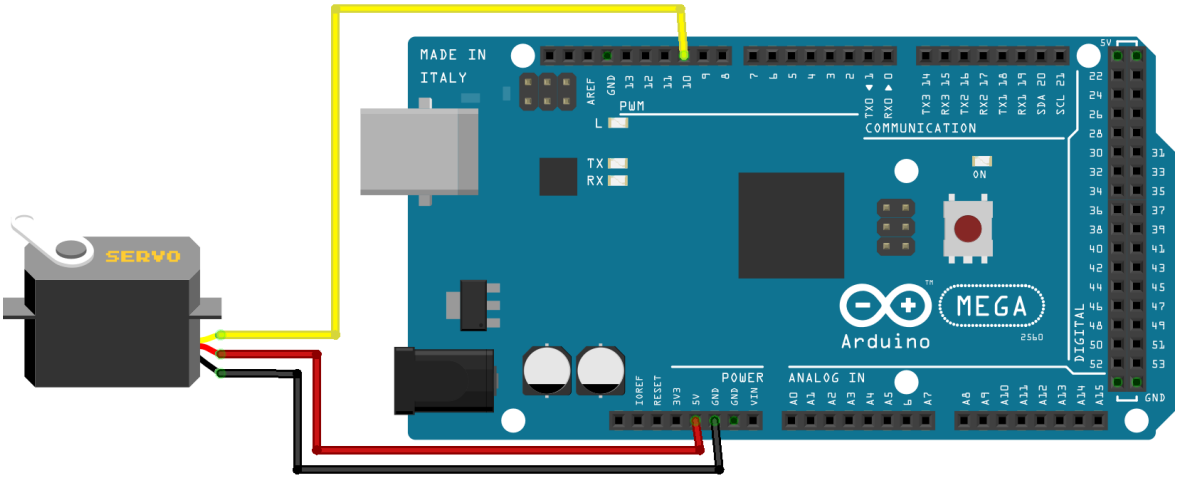
31. RX Module GPS = Pin 14 TX3 Arduino Mega2560
32. TX Module GPS = Pin 15 RX3 Arduino Mega2560
33. GND = Pin GND Arduino Mega2560
34. VCC = Pin 5V Arduino Mega2560

Lampiran 14 Arduino to Optocoupler



35. Data Optocoupler (D0) = Pin 15 RX3 Arduino Mega2560
36. GND = Pin GND Arduino Mega2560
37. VCC = Pin 3V3 Arduino Mega2560

Lampiran 15 Arduino to Servo

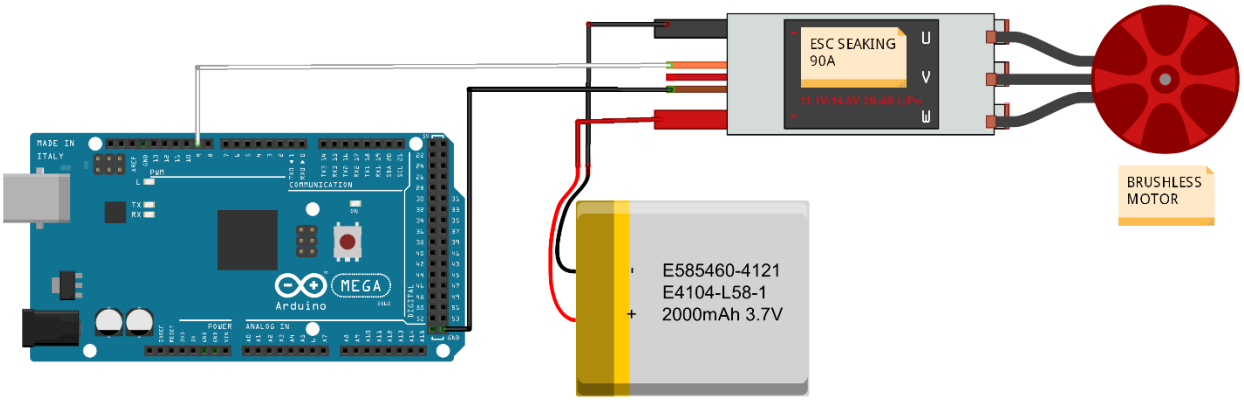


38. Data Servo = Pin 10 Output Rudder Arduino Mega2560

39. GND = Pin GND Arduino Mega2560

40. VCC = Pin 3V3 Arduino Mega2560

Lampiran 16 Arduino to Electric Speed Control (ESC)



41. Data ESC = Pin 9 Output Throtle Arduino Mega2560

42. GND = Pin GND Arduino Mega2560

LAMPIRAN KODE PROGRAM ARDUINO

Lampiran 17 Kode Program pada Prototype (TX)

Tab 1 Looping Code

```
#include <SoftwareSerial.h>
#include <TinyGPS++.h>
static const uint32_t GPSBaud = 9600;
TinyGPSPlus gps; // Inisialisasi objek TinyGPS++

#include <SPI.h>
#include <nRF24L01.h>
#include <RF24.h>
#include <math.h>
RF24 radio(7, 8); // CE = 8 dan CSN 10
const byte address[6] = "00001";

#include <Servo.h>
Servo myRudder;
Servo myTrotle;
int throtle = 0;
int rudder  = 0;

#include <Wire.h>
#include <Adafruit_Sensor.h>
#include <Adafruit_HMC5883_U.h>
/* Assign a unique ID to this sensor at the same time */
Adafruit_HMC5883_Unified mag = Adafruit_HMC5883_Unified(12345);
int targetHeading;              // arah sudut yang dituju
int currentHeading;             // arah sudut saat ini
int headingEror;               // signed (+/-) difference between targetHeading
and currentHeading
//int headingDegrees;
#define TOLERANSI_ARAH 4 // tolerance +/- (in degrees) within which we don't
attempt to turn to intercept targetHeading

#define MUX_PIN 4
#define SERVO1_IN_PIN 2 // RC Receiver Throttle servo in
#define SERVO2_IN_PIN 3 // RC Receiver Rudder servo in

#define RADIO_CONTROL

#define MAX16_THROTTLE 1340
#define MIN16_THROTTLE 1600
#define MAX16_YAW 1700
#define MIN16_YAW 900
```

```
#define REVERSE_YAW 1
#define MIDDLE_YAW 90
#define HEADING_MAX 120
#define HEADING_MIN 60
#define Throtle_On 1605

float currentLat,
      currentLong;
      //speed_over_ground;

int distanceToTarget,            // current distance to target (current waypoint)
    originalDistanceToTarget;    // distance to original waypoing when we started
navigating to it

#define WAYPOINT_DIST_TOLERANE  2   //tolerance in meters to waypoint; once
within this tolerance, will advance to the next waypoint
#define stopwaypoint 0              //second //coba 0.5
int current_waypoint = 0;

/*
circle pendek
  {-5.219292377218575, 119.50039151025976},
  {-5.219302393798693, 119.50032445503984},
  {-5.219256317528798, 119.50026745810293},
  {-5.219204899078689, 119.50027081086394},
  {-5.219163497206703, 119.50031573786129},
  {-5.219171510472459, 119.50037541700699},

zigzag pendek
  {-5.219273399115422, 119.50037353580616},
  {-5.219223316210886, 119.50031050389944},
  {-5.219165887808761, 119.50035744255338},
  {-5.219117808212239, 119.50028904622908},
  {-5.219109127173596, 119.50034671371822},
  {-5.219189259833512, 119.50038962905894}, //home

3 line
  {-5.219331317787504, 119.50022510303369},
  {-5.219159352775196, 119.50012805211375},
  {-5.219040489324569, 119.50021187113917},
  {-5.219150671719818, 119.50032653558368},

    {-5.219278259490122, 119.50035543800072},
  {-5.2192422263160685, 119.50032147652779},
  {-5.219223987502472, 119.50035209127357},
```

```
  {-5.219187150562354, 119.50031455802124},
  {-5.219167234216207, 119.50035157558641},
  {-5.219138806961093, 119.50031849984445},
  {-5.219113001729723, 119.50032366988763},
  {-5.219201149133463, 119.50034264811708},
*/
/*
ZIGZAG JAUH JAUH
{-5.2193282773398595, 119.5003851147396}, //ZIGZAG JAUH JAUH
{-5.219240799204988, 119.50020339508998},
{-5.219123939082114, 119.50033884663695},
{-5.219036460918744, 119.50019467791124},
{-5.219027112106667, 119.50033080001039},
{-5.219197394019034, 119.50040992517147},

CIRCLE JAUH JAUH
{-5.219306862354589, 119.50039834885911}, //CIRCLE JAUH JAUH
{-5.219336578207807, 119.50034302830066},
{-5.219320551680405, 119.50027597307988},
{-5.219277146499959, 119.50022299945549},
{-5.219204359344489, 119.50020623565028},
{-5.219138249902384, 119.50024311602172},
{-5.219105529064831, 119.50031754731677},
{-5.219132239952758, 119.50039130805963},
{-5.219197681623387, 119.50041209517806},
*/

float waypointList[15][2] = {
  {-5.219342936296101, 119.50039388196407}, //CIRCLE JAUH JAUH
  {-5.219336578207807, 119.50034302830066},
  {-5.219320551680405, 119.50027597307988},
  {-5.219277146499959, 119.50022299945549},
  {-5.219204359344489, 119.50020623565028},
  {-5.219138249902384, 119.50024311602172},
  {-5.219105529064831, 119.50031754731677},
  {-5.219132239952758, 119.50039130805963},
  {-5.219197681623387, 119.50041209517806}, //home
};
float targetLat = waypointList[0][0];
float targetLong = waypointList[0][1];
int eror_arah;//eror_output;
// Simpan informasi waypoint yang telah dicapai
//static float reachedWaypoints[15][2]; // Maksimal 10 waypoint, sesuaikan dengan
kebutuhan
```

```
float rpm = 0;
int pid;
unsigned long millisBefore;
volatile int holes;

//inisiasi AIS message
//!AIVDM,1,1,,A,14eG;o@034o8sd<L9i:a;WF>062D,0*7D      contoh AIS message untuk
ujicoba

    byte msgtype ;     //6 bit
    byte repeat ;                    //2 bit
    uint32_t mmsi;          // 30 bit or 9 decimal digit
    byte navigation_status;    //4 bit
    long ROT;               //8 bit   dinamis
    uint32_t SOG ;         //10 bit dinamis
    bool positionAccuracy= 1; //1 bit harusnya dinamis
    long longitude;       //28 bit  dinamis
    long latitude ;       // 27 bit dinamis
    uint32_t COG ;        //12 bit  dinamis
    uint16_t HDG ;        //9 bit dinamis
    uint8_t timestamp;     //6 bit
    uint8_t maneuver_indicator;//2 bit
    uint8_t spare;    //3 bit, not used
    bool RAIMflag;    //1 bit

    uint32_t radio_status; //Radio status message contains syncstate,slot time
out, UTC  time, total 19 bit
    uint8_t syncState ; //2 bits
    uint8_t slotTimeout; //3 bits
    String subMessage; // 14 bits // 14 bits 16h 37 min


    //float course_over_ground = 235.0;
    float speed_over_ground ;
    //float lon =-123.8777500;
    //float lan =49.2002833;
     float ROT_SENSOR = 0;//change the value to Sensor value, this initially set
for debugging code

unsigned long previousMillis_AIS = 0;
unsigned long previousMillis_RPM = 0;
const long interval_AIS = 100; // kirim AIS data setiap 0,1 detik
const long interval_RPM = 100; // kirim data RPM setiap 0,1 detik juga bergantian
bool isAISDataSent = false;
```

```
enum State {
  WAIT_FOR_AIS,
  WAIT_FOR_RPM,
};

State currentState = WAIT_FOR_AIS;

void setup() {
  Serial.begin(9600);
  Serial3.begin(GPSBaud);
  init_NRF24 ();
  // Inisialisasi ArduPilot dan kontrol RC
  init_ardupilot();
  init_RC_control();

  myTrotle.attach(9);
  myRudder.attach(10);

  pinMode(MUX_PIN,INPUT);
  pinMode(2, INPUT);
  pinMode(3, INPUT);

  // Initialise the compass
  if(!mag.begin())
  {
    // There was a problem detecting the HMC5883 ... check your connections
    Serial.println("Ooops, no HMC5883 detected ... Check your wiring!");
    while(1);
  }


  //RPM
  pinMode(18, INPUT);
  attachInterrupt(digitalPinToInterrupt(18), count, FALLING);
}

void loop() {
  while (Serial3.available() > 0)
    if (gps.encode(Serial3.read()))
      processGPS();

#ifdef RADIO_CONTROL
  if (check_radio() > 0) {
    Serial.println("RC_Mode");
    read_radio();
```

```
    myRudder.write(rudder);
    myTrotle.write(throtle);
    send_data_to_ground();
  }
  else {
    if (currentLong > 1 && targetLong > 1){
      currentHeading = readCompass();
      calcDesiredTurn();
      move_kapal();

    }
  }
#endif
  RPM();
  print_Info();
}
void print_Info(){
  Serial.println("Auto_Mode");
  Serial.print("Latitude: ");
  Serial.println(currentLat, 16);
  Serial.print("Longitude: ");
  Serial.println(currentLong, 16);
  Serial.print("RPM = ");
  Serial.println(rpm);
  Serial.print("TARGET LAT = ");
  Serial.println(targetLat, 6);
  Serial.print("TARGET LON = ");
  Serial.println(targetLong, 6);
  Serial.print("targetHeading: ");
  Serial.println(targetHeading);
  Serial.print("distanceToTarget: ");
  Serial.println(distanceToTarget);
  Serial.print("headingEror: ");
  Serial.println(headingEror);
  Serial.print("eror_arah: ");
  Serial.println(eror_arah);
  Serial.print("headingDegrees: ");
  Serial.println(currentHeading);
  Serial.println("============");
  //delay(1000);
}
```

Tab 2 Code GPS & Compas

```
void processGPS(){
  if (gps.location.isValid()) {
    currentLat = gps.location.lat();
    currentLong = gps.location.lng();
    speed_over_ground = gps.speed.kmph(); // KM/H
    // update the course and distance to waypoint based on our new position
    distanceToWaypoint();
    courseToWaypoint();
  }
}

int distanceToWaypoint(){
  float delta = radians(currentLong - targetLong);
  float sdlong = sin(delta);
  float cdlong = cos(delta);
  float lat1 = radians(currentLat);
  float lat2 = radians(targetLat);
  float slat1 = sin(lat1);
  float clat1 = cos(lat1);
  float slat2 = sin(lat2);
  float clat2 = cos(lat2);
  delta = (clat1 * slat2) - (slat1 * clat2 * cdlong);
  delta = sq(delta);
  delta += sq(clat2 * sdlong);
  delta = sqrt(delta);
  float denom = (slat1 * slat2) + (clat1 * clat2 * cdlong);
  delta = atan2(delta, denom);
  distanceToTarget =  delta * 6372795;

  // check to see if we have reached the current waypoint
  if (distanceToTarget <= WAYPOINT_DIST_TOLERANE-1)
  {
    berhenti(); //buatkan void untuk stop throtle
    delay(stopwaypoint*1000);
    nextWaypoint();
  }
  return distanceToTarget;
}

int courseToWaypoint()
{
  float dlon = radians(targetLong - currentLong);
  float cLat = radians(currentLat);
```

```
  float tLat = radians(targetLat);
  float a1 = sin(dlon) * cos(tLat);
  float a2 = sin(cLat) * cos(tLat) * cos(dlon);
  a2 = cos(cLat) * sin(tLat) - a2;
  a2 = atan2(a1, a2);
  if (a2 < 0.0)
  {
    a2 += TWO_PI;
  }
  targetHeading = degrees(a2);
  return targetHeading;
}


int readCompass(){
  sensors_event_t event; //library file name mag.sensor
  mag.getEvent(&event);
  float heading = atan2(event.magnetic.y, event.magnetic.x);

  // Once you have your heading, you must then add your 'Declination Angle',
which is the 'Eror' of the magnetic field in your location.
  // Find yours here: http://www.magnetic-declination.com/
  // Mine is: -13* 2' W, which is ~13 Degrees, or (which we need) 0.22 radians
  // If you cannot find your Declination, comment out these two lines, your
compass will be slightly off.
  float declinationAngle = 0.26; //0.22;
  heading += declinationAngle;

  // Correct for when signs are reversed.
  if(heading < 0)
    heading += 2*PI;

  // Check for wrap due to addition of declination.
  if(heading > 2*PI)
    heading -= 2*PI;

  // Convert radians to degrees for readability.
  float headingDegrees = heading * 180/M_PI;
  return ((int)headingDegrees);
}
```

Tab 3 Autopilot System

```
void nextWaypoint(){
  current_waypoint++;
  targetLat = waypointList[current_waypoint][0];
  targetLong = waypointList[current_waypoint][1];

  if ((targetLat == 0 && targetLong == 0))    // last waypoint reached?
  {
    berhenti();
    Serial.println("FINISH");
  }
  else
  {
    processGPS();
    distanceToTarget = originalDistanceToTarget = distanceToWaypoint();
    courseToWaypoint();

    // Simpan informasi waypoint yang telah dicapai
    //reachedWaypoints[current_waypoint][0] = targetLat;
    //reachedWaypoints[current_waypoint][1] = targetLong;
  }
}

void calcDesiredTurn(void)
{
  headingEror = targetHeading - currentHeading;  // Menghitung selisih antara
arah yang dituju (targetHeading) dengan arah saat ini (currentHeading)

  // Penyesuaian untuk perputaran kompas
  if (headingEror < -180)
    headingEror  += 360;
  if (headingEror > 180)
    headingEror -= 360;

  // Menghitung arah mana yang harus diambil untuk mencapai targetHeading
  if (abs(headingEror) <= TOLERANSI_ARAH)      // Jika dalam toleransi, tidak
perlu berbelok
    eror_arah = 0;
  else if (headingEror < 60 && headingEror > -60)
  {
    eror_arah = headingEror; // Jika selisih kurang dari 60 derajat, maka ambil
langsung nilai selisih tersebut
  }
  else if (headingEror >= 60)
```

```
    eror_arah = 100; // Jika selisih lebih dari 60 derajat, berbelok ke kanan
dengan nilai output sebesar 100
  else if (headingEror <= -60)
    eror_arah = -100; // Jika selisih kurang dari -60 derajat, berbelok ke kiri
dengan nilai output sebesar -100
}
// 1555
void move_kapal(){
  if (eror_arah == 0){
    myTrotle.writeMicroseconds(1600);
    myRudder.write(MIDDLE_YAW);
  }
  else if (eror_arah > -60 && eror_arah < 0){
    myTrotle.writeMicroseconds(1600);
    int center = eror_arah;
    int servo_position = map(center, -59, -1, 119, 91);
    myRudder.write(servo_position);
  }
  else if (eror_arah > 0 && eror_arah < 60){
    myTrotle.writeMicroseconds(1600);
    int center = eror_arah;
    int servo_position = map(center, 1, 59, 89, 61);
    myRudder.write(servo_position);
  }
  else if (eror_arah == 100){
    myTrotle.writeMicroseconds(1600);
    myRudder.write(HEADING_MIN);
  }
  else if (eror_arah == -100){
    myTrotle.writeMicroseconds(1600);
    myRudder.write(HEADING_MAX);
  }
}

void berhenti(){
    myTrotle.writeMicroseconds(0);
    myRudder.write(MIDDLE_YAW);
}
```

Tab 4 Remote Control

```
bool check_radio(){
 if (pulseIn(MUX_PIN,HIGH,25000)>2000) return true;
 else return false;
```

```
}

void read_radio(void) {
   throtle = pulseIn(SERVO1_IN_PIN, HIGH,25000);
   throtle =  map(throtle, MIN16_THROTTLE, MAX16_THROTTLE,1580,1680);

   rudder = pulseIn(SERVO2_IN_PIN, HIGH,25000);
   rudder =  map(rudder, MIN16_YAW, MAX16_YAW, HEADING_MIN, HEADING_MAX);
   rudder = constrain(rudder, HEADING_MIN, HEADING_MAX);
}

void init_RC_control(){
  pinMode(MUX_PIN ,OUTPUT);
  pinMode(SERVO1_IN_PIN,INPUT);
  pinMode(SERVO2_IN_PIN,INPUT);
}

void switch_to_ardupilot (void){
  digitalWrite(MUX_PIN,LOW);
}

void switch_to_radio (void){
  digitalWrite(MUX_PIN,HIGH);
}

void init_ardupilot(void){
  pinMode(2,INPUT);
  pinMode(3,INPUT);

  digitalWrite(10,LOW);
  pinMode(10,OUTPUT);
  digitalWrite(9,LOW);
  pinMode(9,OUTPUT);

  init_RC_control();
  switch_to_radio();
}
```

Tab 5 Optocoupler

```
void RPM(){
  if (millis() - millisBefore > 1000) {
    rpm = (holes / 2.0)*60;
    holes = 0;
    millisBefore = millis();
```

```
  }
  delay(100);
}
void count() {
  holes++;
}
//holes = jumlah lubang dalam ring yg berputar dan di deteksi oleh sensor optocoupler
// 2 = jumlah lubang pada ring
// * 60 = konfersi dari detik menjadi menit
```

Tab 6 Ais Control

```
/*
 * fungsi untuk menghitung nilai cheksum yaitu dengan men-XOR kan semua char di dalam tanda ! dan *
  example : !AIVDM,1,1,,A,14eG;o@034o8sd<L9i:a;WF>062D,0*7D cheksum == 7D (hex value)
  diperoleh dngan men-Xor  AIVDM,1,1,,A,14eG;o@034o8sd<L9i:a;WF>062D,0
*/

String cheksum(String payload) {
//char dataString[] = "AIVDM,1,1,,A,13u?etPv2;0n:dDPwUM1U1Cb069D,0";
   byte xorTemp;
   const char* charArray = payload.c_str();
   char copyArray[payload.length() + 1];
   strcpy(copyArray, charArray);
   xorTemp = byte(copyArray[0]);
  //Serial.println(xorTemp);
  // process the remaining string characters
  for(int i = 1; i < sizeof(copyArray) - 1; i++){
    xorTemp ^= byte(copyArray[i]);
    }
  //Serial.print("The checksum equals ");
  //Serial.println(xorTemp, HEX);

  // convert the last XOR result to hexadecimal
  return String(xorTemp,HEX);//return value in hexadecimal
  }

//Fungsi untuk mengkonversi ke nilai biner
String createbinary(long input,int bits){
  String temp = String(input,BIN);
  if(temp.length()<bits){
```

```
  while (temp.length()<bits){
    temp="0"+temp;}
  }
return temp;
}

//Fungsi untuk mengkonversi data biner ke AIS character
String ascii(String binaryString){
 String asciiCharacter ;
 for (int i = 0; i < binaryString.length(); i += 6) {
    String chunk = binaryString.substring(i, i + 6); //break the binary each six
bits
    int decimalValue = strtol(chunk.c_str(), NULL, 2);//convert to decimal value
   //Serial.println(decimalValue);
    if (decimalValue > 39){
      decimalValue +=8;
      }
    decimalValue+=48;
    //Serial.println(decimalValue);
    asciiCharacter += String((char)decimalValue); // convert DEC value to ASCII
char

  //Serial.print (asciiCharacter);
  }
  return asciiCharacter;
}

//complete function to build AIS message
String AISdata(){
  String str=" ";

  String *strptr=&str;

  setParam();//call function

  str =
createbinary(msgtype,6)+createbinary(repeat,2)+createbinary(mmsi,30)+createbinary
(navigation_status,4)+createbinary(ROT&0xFF,8);
  str += createbinary(SOG,10)+
createbinary(positionAccuracy,1)+createbinary((longitude&0xFFFFFFF),28)+
createbinary(latitude&0x7FFFFF,27)+createbinary(COG,12)+ createbinary(HDG,9);
  str +=createbinary(timestamp,6)+
createbinary(maneuver_indicator,2)+createbinary(spare,3)+
createbinary(RAIMflag,1);//+ createbinary(radio_status,19);
  str +=createbinary(syncState,2)+createbinary(slotTimeout,3)+ subMessage;
```

```
  //Serial.println(str.length());
  //Serial.println(str);
  //PENTING
  //*strptr="AIVDM,1,1,,A," + ascii(str)+",0";//Add sentence head "AIVDM" and
",0"
  //str = "!"+str+"*"+cheksum(str);//Add '!' and checksum

  //pesan = str;
  //delay(500);
  //Serial.println(str);
  *strptr= ascii(str);
  return str;
  }
```

Tab 7 Transfer Data Use NRF24L01

```
void init_NRF24 (){
  radio.begin();
  radio.openWritingPipe(address);
  radio.setPALevel(RF24_PA_MAX);
  radio.setDataRate(RF24_250KBPS);
  radio.stopListening();
}
/*contoh data yang akan diterima
Returned MMSI: 316001245 (12D5CBDD )
Returned SOG: 0.2 nm
Returned COG: 0.0 degrees
Returned LAT: -5.2333 degrees
Returned LONG: 119.5047 degrees
Received ABC Data:
Jarak Target: 24.00
Eror Arah: 100.00
RPM: 0.00 */

void send_data_to_ground() {
  unsigned long currentMillis = millis();

  switch (currentState) {
    case WAIT_FOR_AIS:
      if (currentMillis - previousMillis_AIS >= interval_AIS) {
        previousMillis_AIS = currentMillis;
        sendAISdata();
        isAISDataSent = true;
        currentState = WAIT_FOR_RPM;
```

```
      }
      break;

    case WAIT_FOR_RPM:
      if (isAISDataSent && currentMillis - previousMillis_RPM >= interval_RPM) {
        previousMillis_RPM = currentMillis;
        sendRPMData();
        currentState = WAIT_FOR_AIS;
        isAISDataSent = false; // Setel kembali flag setelah mengirim data RPM
        //Serial.flush();
      }
      break;
  }
}

void sendAISdata(){
  char pesanbuffer[50];
  String pesan = AISdata();
  //String pesan = "14eG;o@000P000000000000>062D";
  pesan.toCharArray(pesanbuffer, 50);
  radio.write(&pesanbuffer, sizeof(pesanbuffer));
  //delay(500);
}
//Fungsi untuk memasukkan semua nilai pesan
//Beberapa pesan masih bersifat statis
void setParam(){
  msgtype =1;
  repeat =0;
  mmsi=316001245;
  navigation_status= 0;
  ROT_AIS(ROT_SENSOR);
  SOG = speed_over_ground*10*0.540003; //km/h * 10*0.540003(agar presisi *10
)(0.54003 konversi km/h ke knot (nm))
  positionAccuracy= 1;
  longitude =currentLong*600000 ;// convert degree to 1/10000 min, east(positive)
west(negative).
  latitude  =currentLat*600000; // convert degree to 1/10000 min,Nort(+) South(-)
  COG = targetHeading*10; //3600 (0xE10) data not available
  HDG = currentHeading; //change this value to sensor value
  timestamp = 7;
  maneuver_indicator=0;
  spare=0;
  RAIMflag=0;
  radio_status=0 ;
  syncState = 0;
```

```
  slotTimeout= 1;
  subMessage= "10000010010100";//shouldbe UTC from GPS
  //String(radio_status) =
createbinary(syncState,2)+createbinary(slotTimeout,3)+createbinary(UTChours,5)+cr
eatebinary(UTCmin,9);
  }

//Fungsi untuk mengkonversi nilai Rate of Turn
long ROT_AIS (float rotSensor ){ //rotSensor must be in degree/s(merupakan nilai
pembacaan dari sensor (derajat/s)
  //float ROT;  //708/60
    if (0 < rotSensor ){
    ROT = 4.733 * sqrt(rotSensor);
    //ROT = round(ROT);
   }
   if (rotSensor < 0){
    ROT = 4.733 * sqrt(abs(rotSensor));
    ROT *=  -1;
   }
     else{
     ROT= 0;
     }
     //Serial.print(ROT);
     return ROT;
}
void sendRPMData() {

  // Implementasi pengiriman data RPM di sini
  String latStr = String(currentLat, 12); // Mengonversi currentLat menjadi
string dengan 6 angka di belakang koma
  String longStr = String(currentLong, 12); // Mengonversi currentLong menjadi
string dengan 6 angka di belakang koma

  // Mengonversi nilai latStr dan longStr ke dalam format yang diinginkan
  latStr = latStr.substring(0, latStr.indexOf('.') + 7); // Mengambil 7 karakter
termasuk titik
  longStr = longStr.substring(0, longStr.indexOf('.') + 7); // Mengambil 7
karakter termasuk titik

  String pesan = latStr + "A" + longStr + "B"  + String(currentHeading) + "C"+
String(distanceToTarget) /*"C"+ String(distanceToTarget)*/ + "D"+ String(rpm) +
"E"; // Membuat pesan dengan format yang diinginkan
  char pesanbuffer[50];
  pesan.toCharArray(pesanbuffer, 50); // Mengonversi pesan menjadi array char
```

```
  // Mengirim data melalui radio
  radio.write(&pesanbuffer, sizeof(pesanbuffer));
}
```

Lampiran 18 Kode Program pada Ground Station (RX)

```
#include <Arduino.h>
#include <AIS.h>
#include <SPI.h>
#include <nRF24L01.h>
#include <RF24.h>

RF24 radio(7, 8); // CE = 8 dan CSN 10
const byte address[6] = "00001";


/* Coming from util.h */
#define htonl(x) ( ((x)<<24 & 0xFF000000UL) | \
                   ((x)<< 8 & 0x00FF0000UL) | \
                   ((x)>> 8 & 0x0000FF00UL) | \
                   ((x)>>24 & 0x000000FFUL) )
#define htons(x) ( ((x)<<8) | (((x)>>8)&0xFF) )

void printDegrees(long min4)
{
//    Serial.print(min4); Serial.print("
(");Serial.print(min4,16);Serial.println(")");
    long intPart = min4 / 60L;
    long fracPart = intPart % 10000L;
    if (fracPart < 0)
      fracPart = -fracPart;
    char frac[6];
    sprintf(frac, "%04ld", fracPart);
    Serial.print(intPart/10000L);Serial.print(".");Serial.print(frac);
}

void showMMSI(AIS& ais_msg) {
  unsigned long mmsi = ais_msg.get_mmsi();
  Serial.print("Returned MMSI: ");
  Serial.print(mmsi);
  Serial.print(" ("); Serial.print(mmsi, 16); Serial.print(" )");
  Serial.println("");
}
```

```
void showSOG(AIS& ais_msg) {
    unsigned int SOG = ais_msg.get_SOG();
    Serial.print("Returned SOG: ");
    Serial.print( (SOG) / 10 ); Serial.print("."); Serial.print( (SOG) % 10 );
Serial.println(" kn");
}

void showCOG(AIS& ais_msg) {
    unsigned int COG = ais_msg.get_COG();
    Serial.print("Returned COG: ");
    Serial.print( (COG) / 10 ); Serial.print("."); Serial.print( (COG) % 10 );
Serial.println(" degrees");
}

void showLatitude(AIS& ais_msg) {
    long LAT = ais_msg.get_latitude();
    Serial.print("Returned LAT: "); printDegrees(LAT); Serial.println("
degrees");
}

void showLongitude(AIS& ais_msg) {
    long LONG = ais_msg.get_longitude();
    Serial.print("Returned LONG: "); printDegrees(LONG); Serial.println("
degrees");
}

void setup() {
  Serial.begin(9600);

  radio.begin();
  radio.openReadingPipe(0, address);
  radio.setPALevel(RF24_PA_MAX);
  radio.setDataRate(RF24_250KBPS);
  radio.startListening();
}
void loop() {
    char text[50] = "";

    while (radio.available() > 0) {
        radio.read(&text, sizeof(text));

        String receivedMessage = String(text);

        if (receivedMessage.indexOf('A') != -1 && receivedMessage.indexOf('B') !=
-1 && receivedMessage.indexOf('C') != -1) {
```

```
            receivedMessage.trim();

            // Parse the message
            float a, b, c, d, e;
            int indexA = receivedMessage.indexOf('A');
            int indexB = receivedMessage.indexOf('B');
            int indexC = receivedMessage.indexOf('C');
            int indexD = receivedMessage.indexOf('D');
            int indexE = receivedMessage.indexOf('E');

            // Extract values of a, b, and c from the message
            a = receivedMessage.substring(0, indexA).toFloat();
            b = receivedMessage.substring(indexA + 1, indexB).toFloat();
            c = receivedMessage.substring(indexB + 1, indexC).toFloat();
            d = receivedMessage.substring(indexC + 1, indexD).toFloat();
            e = receivedMessage.substring(indexD + 1, indexE).toFloat();

            // Process the values as needed
            //Serial.println("Received ABC Data:");
            Serial.print("lat: ");
            Serial.println(a,12);
            Serial.print("lon: ");
            Serial.println(b,12);
            Serial.print("RPM: ");
            Serial.println(e);
            Serial.print("Jarak Target: ");
            Serial.println(d);
            Serial.print("Heading: ");
            Serial.println(c);
        } else {
            AIS ais_msg(String(text).c_str());

            showMMSI(ais_msg);
            showSOG(ais_msg);
            showCOG(ais_msg);
            showLatitude(ais_msg);
            showLongitude(ais_msg);
        }
    }
}
```

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Dosen Pembimbing :
1. Rahimuddin, S.T., M.T., Ph.D.
2. Dr.Eng Ir. Andi Amijoyo Mochtar, ST., M.Sc

Dapat dibuatkan Surat Penugasan Bimbingan Tugas Akhir
Demikian penyampaian kami, atas perhatian dan kerjasamanya diucapkan terima kasih.

G o w a, 20 Juni 2023
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Makassar, 25 Juni 2024
a.n. Direktur Pendidikan
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Anggota : 1. Andi Husni Sitepu, S.T., M.T.
2. Baharuddin, S.T., M.T.

Judul Tugas Akhir mahasiswa yang bersangkutan adalah :
Perancangan Sistem Monitoring Putaran Mesin Dan Navigasi Kapal Jarak Jauh Berbasis Mikrokontroler

Untuk dapat diterbitkan surat penugasannya.

Demikian penyampaian kami, atas perhatian dan kerjasamanya diucapkan terima kasih.

Gowa, 07 Juni 2024
Ketua Departemen Teknik Sistem Perkapalan

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SURAT PENUGASAN

No. 13181/UN4.7.1/TD.06/2024

Dari : Dekan Fakultas Teknik Universitas Hasanuddin
Kepada : mereka yang tercantum namanya dibawah ini.
Isi :

1. Bahwa Berdasarkan Peraturan Rektor Universitas Hasanuddin Nomor 29/UN4.1/2023 tentang Penyelenggaraan Program Sarjana Universitas Hasanuddin dengan ini menugaskan Saudara sebagai PANITIA SEMINAR HASIL Program Strata Satu (S1) Teknik Sistem Perkapalan Fakultas Teknik Universitas Hasanuddin dengan susunan sebagai berikut :

   Ketua : Rahimuddin, S.T., M.T., Ph.D.
   Sekretaris : Dr. Eng. Andi Amijoyo Mochtar, S.T., M.Sc.
   Anggota : 1. Andi Husni Sitepu, S.T., M.T.
   2. Baharuddin, S.T., M.T.

   Untuk menguji bagi mahasiswa tersebut dibawah ini :

   Nama/NIM : Muhammad Nur Azhar Gunawang / D091191020

   Judul Thesis/Skripsi :
   Perancangan Sistem Monitoring Putaran Mesin Dan Navigasi Kapal Jarak Jauh Berbasis Mikrokontroler

2. Waktu seminar ditetapkan oleh Panitia Seminar Program Strata Satu (S1).
3. Agar surat penugasan ini dilaksanakan sebaik-baiknya dengan penuh rasa tanggung jawab.
4. Surat penugasan ini berlaku sejak tanggal ditetapkan sampai dengan berakhirnya Seminar Hasil tersebut, dengan ketentuan bahwa segala sesuatunya akan ditinjau dan diperbaiki sebagaimana mestinya apabila dikemudian hari ternyata terdapat kekeliruan dalam keputusan ini.

Ditetapkan di Gowa,
Pada Tanggal, 07 Juni 2024
a.n Dekan,
Wakil Dekan Bidang Akademik dan Kemahasiswaan,

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Lamp : -
Hal : Undangan Ujian Akhir

Kepada
Yth. :
1. Rahimuddin, S.T., M.T., Ph.D.
2. Dr. Eng. Ir. Andi Amijoyo Mochtar, S.T., M.Eng.
3. Baharuddin, S.T., M.T.
4. Andi Husni Sitepu, S.T., M.T.

Dengan hormat,
Kami mengundang Saudara/saudari kiranya berkenan hadir untuk menyaksikan/bertindak selaku penguji Ujian Akhir Strata Satu Fakultas Teknik Universitas Hasanuddin yang akan diselenggarakan pada :

Hari / Tanggal : **Selasa, 23 Juli 2024**
Jam : **08:00 - 10:00 WITA**
Tempat : **Ruang Sidang Teknik Sistem Perkapalan**

Dibawakan oleh
Nama/Stambuk : Muhammad Nur Azhar Gunawang / D091191020

Atas kesedian dan kehadiran Saudara/Saudari diucapkan terima kasih.

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Terhadap Mahasiswa

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Stambuk	:	D091191020
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Waktu	:	08:00 - 10:00 WITA
Tempat	:	Ruang Sidang Teknik Sistem Perkapalan
Keputusan Sidang/ Catatan	:	Lulus dengan nilai A (88.75).
Catatan	:	Koreksi sibuat sesuai saran penguji.

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