

DAFTAR ISI

HALAMAN JUDUL	i
HALAMAN PENGESAHAN	ii
PERNYATAAN BEBAS PLAGIASI	iii
NASKAH SOAL TUGAS AKHIR	iv
HALAMAN PERSEMBAHAN	v
KATA PENGANTAR	vi
DAFTAR ISI	ix
DAFTAR GAMBAR	xiv
DAFTAR TABEL	xviii
DAFTAR LAMPIRAN	xix
DAFTAR NOTASI DAN SINGKATAN	xx
ABSTRACT	xxiv
ABSTRAK	xxv
BAB I PENDAHULUAN	1
1.1 Latar Belakang	1
1.2 Rumusan Masalah	2
1.3 Batasan Penelitian	3
1.4 Tujuan Penelitian	3
1.5 Manfaat Penelitian	3
BAB II TINJAUAN PUSTAKA	4
2.1 Pengertian Umum <i>Unmanned Aerial Vehicle</i> (UAV)	4
2.2 Jenis Jenis UAV	4

2.2.1	<i>Fixedwing</i>	5
2.2.2	<i>Flappingwing</i>	6
2.2.3	<i>Rotarywing</i>	7
2.2.4	VTOL-Plane	13
2.2.5	Penelitian terkait VTOL-Plane	13
2.3	Sumbu Gerak Pesawat	18
2.3.1	<i>Roll</i>	19
2.3.2	<i>Pitch</i>	19
2.3.3	<i>Yaw</i>	19
BAB III LANDASAN TEORI		20
3.1	<i>Operational Setup</i>	20
3.2	Tahap Tahap Perancangan	22
3.2.1	<i>Design Requirement and Objectives (DRO)</i>	22
3.2.2	<i>Conceptual Design</i>	25
3.2.3	<i>Preliminary Design</i>	26
3.2.4	<i>Detailed Design</i>	26
3.3	<i>Thrust Loading VTOL</i>	26
3.4	<i>Wing Loading dan Thrust-to-Weight Ratio</i>	27
3.4.1	<i>Wing loading</i>	27
3.4.2	<i>Thrust-to-weight ratio</i>	28
3.5	<i>Wing Design and Sizing</i>	29
3.5.1	Posisi sayap terhadap <i>fuselage</i>	29
3.5.2	<i>Planform sayap</i>	30
3.6	<i>Airfoil</i>	35
3.6.1	Bagian bagian <i>airfoil</i>	36

3.6.2 Jenis <i>airfoil</i>	37
3.6.3 <i>Airfoil software analysis XFLR5</i>	39
3.7 <i>Tailplane</i>	40
3.7.1 <i>Horizontal Stabilizer</i>	40
3.7.2 <i>Vertical Stabilizer</i>	42
3.8 Analisis Aerodinamika	43
3.8.1 Geometri	44
3.8.2 <i>Meshing</i>	44
3.8.3 <i>Fluent Setup</i>	44
3.8.4 <i>Solution</i>	47
3.8.5 <i>Result</i>	47
3.9 Persamaan Transisi	47
3.10 <i>Center of Gravity dan Konsep Stabilitas</i>	48
3.10.1 <i>Center of Gravity (CG) Pesawat</i>	49
3.10.2 <i>Center of Gravity VTOL</i>	51
3.11 Baterai	54
BAB IV METODE PENELITIAN	56
4.1 <i>Design Requirements and Objectives (DRO)</i>	57
4.2 <i>Conceptual Design</i>	57
4.3 <i>Preliminary Design</i>	57
4.4 Analisis Aerodinamika	59
4.5 <i>Power Analysis</i>	59
4.6 <i>Center of Gravity</i>	59
4.7 <i>Software Design and Analysis</i>	59
4.7.1 Autodesk Inventor Professional 2019	59

4.7.2 XFLR5	60
4.7.3 ANSYS Fluent 16.0	61
BAB V HASIL DAN PEMBAHASAN	62
5.1 <i>Design Requirements and Objectives</i>	62
5.1.1 Muatan (<i>Payload</i>)	62
5.1.2 <i>Maximum Take-off Weight</i>	62
5.1.3 Daya tahan (<i>Endurance</i>)	63
5.1.4 Cakupan area misi (<i>range of action</i>)	63
5.1.5 Rentang kecepatan	63
5.1.6 Ketinggian (<i>Altitude</i>)	64
5.1.7 Kondisi lingkungan	64
5.1.8 Pemilihan sistem dan kategori UAV	64
5.2 <i>Conceptual Design</i>	64
5.2.1 Perencanaan sayap	65
5.2.2 Perencanaan <i>fuselage</i>	65
5.2.3 Perencanaan <i>Tailplane</i>	65
5.2.4 Perencanaan konfigurasi lengan VTOL	65
5.2.5 Perencanaan posisi motor horizontal	66
5.2.6 Gambar konsep pesawat VTOL-Plane	66
5.3 Perancangan VTOL	68
5.3.1 Perancangan propulsi VTOL	68
5.3.2 Perancangan lengan VTOL	68
5.3.3 Perancangan <i>propeller protector</i>	70
5.3.4 Perancangan <i>drag reductor</i> lengan VTOL	72
5.4 Pemilihan <i>Airfoil</i>	72

5.4.1 Hasil analisis <i>airfoil</i>	74
5.5 Perancangan Sayap	78
5.5.1 <i>Wing Loading</i>	78
5.5.2 Geometri Sayap	79
5.6 Perancangan <i>Fuselage</i>	83
5.7 Perancangan <i>Tailplane</i>	84
5.7.1 <i>Horizontal Stabilizer</i>	84
5.7.2 <i>Vertical stabilizer</i>	86
5.8 Analisis Aerodinamika (<i>Software Analysis</i>)	88
5.8.1 Geometri	88
5.8.2 <i>Meshing</i>	90
5.8.3 <i>Fluent Setup</i>	91
5.8.4 CFD-Post	98
5.9 Perancangan Propulsi <i>Plane</i>	105
5.10 Perencanaan <i>Power Supply</i>	106
5.10.1 <i>Power supply fase hover</i>	106
5.10.2 <i>Power supply fase cruise</i>	107
5.11 Analisis Transisi	108
5.12 <i>Center of Gravity</i>	111
BAB VI PENUTUP	115
6.1 Kesimpulan	115
DAFTAR PUSTAKA	118
LAMPIRAN	121