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## ORKAN project work plan

Project name: Unmanned Aerial Vehicle Policy Ecosystem (ORKAN)  
Project leader: Full prof. Neven Vrčec, PhD  
Start date: 01/02/2020  
End date: 31/01/2024

Objectives	Activities	Milestones	Deliverables	Research group members	Duration of activities (from-to, in months)
<b>Months 1 - 12</b>					
O1 Research legal and ethical state of the art, development of risk assessment methodology	A1.1. Organize team meeting and define work plan		D1.1. Minutes of the meeting	Neven Vrčec, Ivan Magdalenic, Luka Milić, Renata Mekove, Sandro Gerić, Marko Mljač, Zlatkko Stapić, Markus Schatten,	1



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				Boris Tomaš, Mario Šercer	
	A1.2. Research and define most popular and mainstream UAVs for general public and team meeting		D1.2.1. Analysis result of most popular and mainstream UAVs for general public  D1.2.2. Minutes of the meeting	Sandro Gerić, Renata Mekovec	2-4
	A1.3. Research privacy aspects, legal and ethical state of the art in UAV operations		D1.3. Analysis result of privacy aspects, legal and ethical state of the art in UAV operations, prepared paper for publication in A1 publication	Sandro Gerić, Renata Mekovec	2-7
	A1.4. Development of recommendations for UAV operations		D1.4. Recommendations developed and published on the project's web page	Sandro Gerić, Renata Mekovec	2-12
	A1.5. Risk assessment methodology analysis and development	M1.5. Data needed for risk assessment methodology analysis and development gathered and processed		Sandro Gerić	6-12
	A1.6. Risk assessment methodology tool	M1.6. Finished first phase of risk assessment methodology tool development		Sandro Gerić	9-12



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	development and evaluation				
O2 UAV energy efficient communication	A2.1. Equipment testing and team meeting		D2.1. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mljač, Zlatkko Stapić, Markus Schatten, Boris Tomaš, Mario Šercer, Nikola Ivković	12
	A2.2. Classify target intruder UAVs communication technology footprint		D2.2. Report: Mainstream UAV communication practices	Ivan Magdalenić, Luka Milić, Nikola Ivković	2-4
	A2.3. Select and modify communication technology to increase energy efficiency		D2.3 Article: New energy efficient communication protocol, sent to WOS CC Q2 journal	Ivan Magdalenić, Luka Milić, Nikola Ivković	4-12
	A2.4. Enable UAV communication	M2.4. Finished first phase of UAV communication implementation		Ivan Magdalenić, Luka Milić, Boris,	9-12



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				Tomaš, Nikola Ivković	
O3 Create RF scanner unit for constellation UAV	A3.1. Research appropriate constellation UAV RF device for intercepting intruder UAV communication		D3.1 Report: communication devices analysis and recommendation	Ivan Magdalenić, Luka Milić, Boris Tomaš	2-4
	A3.2. Augment constellation UAV with RF scanning capabilities	M3.2. Literature review and basis for augmentation of constellation UAV with RF scanning capabilities		Ivan Magdalenić, Luka Milić, Nikola Ivković	10-12
	A3.3. Develop RF scanning software module for selected intruder UAV signal detection	M3.3. Literature review and basis for developing RF scanning software module for selected intruder UAV signal detection		Ivan Magdalenić, Luka Milić, Nikola Ivković	10-12
O4 Telemetry and control system for UAV constellation management "UAV constellation	A4.1. Software system design	M4.1. Finished first phase of software system design		Zlatko Stapić, Marko Mijač, Boris Tomaš	4-12



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control centre (UCCC)"					
O5 Signal source localization	A5.1. Research feasibility of UAV signal localization using signal strength		D5.1. Report: UAV pilot localization using control signal strength analysis in RF spectrum	Neven Vrček, Boris Tomaš	2-9
	A5.2. Research feasibility of UAV signal localization using time of arrival		D5.2. Report: UAV pilot localization using control signal time of arrival analysis in RF spectrum	Neven Vrček, Boris Tomaš	2-9
	A5.3. Implement localization algorithm on UAV and entire constellation	M5.3. Finished first phase of implementation of localization algorithm on UAV and entire constellation		Neven Vrček, Boris Tomaš	10-12
	A5.4. Research feasibility and implement AI powered intruder pilot localization	M5.4. Finished first phase of researching feasibility and implementation of AI powered intruder pilot localization		Markus Schatten, Nikola Ivković	2-12
O6 UAV constellation navigation	A6.1. Team meeting		D6.1. Minutes of the meeting	Neven Vrček, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro	8



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				Gerić, Marko Mljač, Zlatkko Stapić, Markus Schatten, Boris Tomaš, Mario Šercer, Karl Sölvi Guðmundsson, Nikola Ivković	
	A6.2. Research swarm and constellation layouts in practice and nature and select top candidates		D6.2. Article: Constellation models in practice	Markus Schatten, Boris Tomaš	2-9
O7 Measure performance of final constellation on localizing target UAV pilot	A7.1. Experiment design and team meeting	M7.1. Gathered necessary data for experiment design and definition of key variables	D7.1.1. Report: Experiment design and definition of key variables D7.1.2. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mljač, Zlatkko Stapić, Markus Schatten, Boris Tomaš, Mario Šercer, Nikola Ivković	10-12



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Objectives	Activities	Milestones	Deliverables	Research group members	Duration of activities (from-to, in months)
<b>Months 13 -24</b>					
O1 Research legal and ethical state of the art, development of risk assessment methodology	A1.5. Risk assessment methodology analysis and development		D1.5. Analysis result. Modified risk assessment methodology developed	Sandro Gerić	13
	A1.6. Risk assessment methodology tool development and evaluation		D1.6. Software tool for risk assessment methodology developed for drone use	Sandro Gerić	13-24
O2 UAV energy efficient communication	A2.4. Enable UAV communication		D2.4. Software and hardware implementation	Ivan Magdalenić, Luka Milić, Boris Tomaš, Nikola Ivković	13-18
	A2.5. Experiment: evaluate energy consumption for UAV communication		D2.5. Article: Evaluation of energy efficiency of new communication protocol	Ivan Magdalenić, Luka Milić, Nikola Ivković	13-18



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O3 Create RF scanner unit for constellation UAV	A3.2. Augment constellation UAV with RF scanning capabilities		D3.2. Software and hardware implementation	Ivan Magdalenić, Luka Milić, Nikola Ivković	13-20
	A3.3. Develop RF scanning software module for selected intruder UAV signal detection		D3.3. Software and hardware implementation	Ivan Magdalenić, Luka Milić, Nikola Ivković	13-20
	A3.4. Project team meeting		D3.4. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mljač, Zlatkko Stapić, Markus Schatten, Boris Tomaš, Mario Šercer, Nikola Ivković	21
O4 Telemetry and control system for UAV constellation management "UAV constellation	A4.1. Project team meeting		D4.1. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mljač,	14





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control centre (UCC)"				Zlatkko Stapić, Markus Schatten, Boris Tomaš, Nikola Ivković	
	A4.2. Software system design		D4.2. Report: Software model for UAV constellation control center	Zlatko Stapić, Marko Mijač, Boris Tomaš	13-16
	A4.3. Communication protocol implementation for control system and team meeting		D4.3.1. Communication module software implementation, prepared paper for publication  D4.3.2. Minutes of the meeting	Marko Mijač, Zlatko Stapić, Ivan Magdalenić, Luka Milić, Boris	13-22
	A4.4. Software implementation	M4.4. Finished first phase of software implementation		Marko Mijač, Zlatko Stapić, Boris Tomaš	13-24
	A4.5. Experiment: test the solution in open field with fixed matrix UAV constellation and team meeting		D4.5.1. Report: Constellation navigation experiment report  D4.5.2. Minutes of the meeting	Marko Mijač, Zlatko Stapić, Ivan Magdalenić, Luka Milić, Boris Tomaš, Karl Sölvi Guðmundsson, Mario Šercer	22-24



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O5 Signal source localization	A5.3. Implement localization algorithm on UAV and entire constellation		D5.3. Software and hardware implementation	Neven Vrčec, Boris Tomaš	13-24
	A5.4. Research feasibility and implement AI powered intruder pilot localization		A5.4. Software implementation Report: AI service for localization, prepared paper for publication	Markus Schatten, Nikola Ivković	13-24
	A5.5. Attend international workshop for training, present results of the project		D5.5. Report on workshop attended	Markus Schatten, Boris Tomaš, Zlatko Stapić, Marko Mijač	19
O6 UAV constellation navigation	A6.3. Implement top layouts on UAV constellation and team meeting		D6.3.1. Software implementation on UCCC	Markus Schatten, Boris Tomaš, Zlatko Stapić, Marko Mijač	13-24
O7 Measure performance of final constellation on localizing target UAV pilot	A7.2. Experiment design and team meeting		D7.2.1. Report: Experiment design and definition of key variables D7.2.2. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić,	13-17



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Objectives	Activities	Milestones	Deliverables	Research group members	Duration of activities (from-to, in months)
<b>Months 25 - 36</b>					
O4 Telemetry and control system for UAV constellation management "UAV constellation control centre (UCCC)"	A4.4. Project team meeting		D4.4. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Marko Mijač, Zlatko Stapić, Boris Tomaš, Mario Šercer, Nikola Ivković	26
	A4.5. Software implementation		D4.5. UCCC application solution	Marko Mijač, Zlatko Stapić, Boris Tomaš	25-30
O6 UAV constellation navigation	A6.4. Experiment: evaluate each constellation model for fastest intruder pilot	M6.4. Constellation is operational and ready for field testing	D6.4.1. Report: constellation model testing experiment report, prepared paper for publication D6.4.2. Minutes of the meeting	Markus Schatten, Marko Mijač, Zlatko stapić, Boris Tomaš	23-32



	localization and project team meeting				
O7 Measure performance of final constellation on localizing target UAV pilot	A7.3. Experiment design and project team meeting		D7.3.1. Report: Experiment design and definition of key variables D7.3.2. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš, Nikola Ivković	31-34
	A7.4. Project team meeting		D7.4. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš, Karl Sölvi Guðmundsson	29
	A7.5. Experiment	M7.5. Basis for the experiment is set		Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten,	35-36



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<b>Months 37 -48</b>					
O7 Measure performance of final constellation on localizing target UAV pilot	A7.6. Project team meeting		D7.6. Minutes of the meeting	Neven Vrčec, Ivan Magdalenic, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš, Nikola Ivković, Mario Šercer	38
	A7.7. Experiment and project team meeting		D7.7.1. Prepared paper on ORKAN system D7.7.2. Minutes of the meeting	Neven Vrčec, Ivan Magdalenic, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten,	37-40



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				Boris Tomaš, Karl Sölvi Guðmundsson, Mario Šercer, Nikola Ivković	
	A7.8. Organize workshop and project team meeting		D7.8.1. Workshop plan D7.8.2. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš	41-43
	A7.9. Workshop		D7.9. Workshop held	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš, Nikola Ivković	44



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	A7.10. Final conference		D7.10. Presentation of the project results at the final conference	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš, Nikola Ivković	44-45
	A7.11. Project team meeting		D7.11. Minutes of the meeting	Neven Vrčec, Ivan Magdalenić, Luka Milić, Renata Mekovec, Sandro Gerić, Marko Mijač, Zlatko Stapić, Markus Schatten, Boris Tomaš, Nikola Ivković	47