Appendix K Mid-air Collision Case Study Extended Work

K.1 Stage 1-Predictive Thinking Pipeline 3: Predict the Emergence of AIC Complexity Field for Detailed Operational Scenario Articulation

K.1.1 Step 3.2) Predict the extended list of emergent AIC interactions scenarios

Table K.1 Full AIC extended scenario for the entire articulated problem definition

Step 1: Unsafe Problematic Situations	1. AVP:1.2 n10: [AVP][consider][Environment],1.3 n12: [AVP][detect][By-passing ac],1.4 n17: [AVP][detect][Other ac],1.5 n22: [AVP][detect][Environment],1.6 n1: [AVP][guide][Ownship ac],2. By-passing ac:2.2 n2: [By-passing ac][intersect][Ownship ac],2.3 n7: [By-passing ac][Physically/visually complicate][AVP],2.4 n15: [By-passing ac][sense][Environment],2.5 n18: [By-passing ac][avoid][Other ac],2.6 n23: [By-passing ac][sense][Ownship ac],2. By-passing ac:3.2 n3: [Other ac][avoid][Ownship ac],3.3 n8: [Other ac][Physically/visually complicate][AVP],3.4 n13: [Other ac][avoid][By-passing ac],3.5 n20: [Other ac][sense][Environment],3.6 n24: [Other ac][sense][By-passing ac],2. By-passing ac:4.2 n5: [Ownship ac][sense][Environment],4.3 n6: [Ownship ac][govern][AVP],4.4 n11: [Ownship ac][avoid][By-passing ac],4.5 n16: [Ownship ac][avoid][Other ac],4.6 n21: [Ownship ac][sense][AVP],2. By-passing ac:5.2 n4: [Environment][Physically/visually complicate][Ownship ac],5.3 n9: [Environment][Physically/visually complicate][AVP],5.4 n14: [Environment][Physically/visually complicate][By-passing ac],5.5 n19: [Environment][Physically/visually complicate][Other ac]	
step 2: observed system (obs)	**step 3: observed action**	**step 4: supra source primary purpose**
computerized perception-based mid-air collision avoidance system {active_avp}	the perception model does not detect by-passing aircrafts	preventing mid_air collisions

step 5: auxiliary influence interaction	**step 6: auxiliary control interaction**	**step 7: auxiliary appreciation interaction**

influence goal: to accomplish its primary influence objective, the {active_avp} is designed to indirectly enhance the {own_aircraft_pilot_decision_making_process}, ensuring improved situational awareness and informed decision-making during flight operations. **influence actions** 1. augmenting pilot awareness: the {active_avp} enhances the {own_aircraft_pilot_situation_awareness} by providing real-time insights into the surrounding airspace, thereby improving the pilot's ability to assess and respond to potential hazards. 2. ensuring environmental perception: the {active_avp}	**control goal** the {active_avp} is designed to generate {avoidance_strategy_recommendation} to effectively influence the {own_aircraft_pilot_decision_making_process}, ensuring safe and informed pilot decision-making in response to dynamic airspace conditions. **control actions:** 1. trajectory identification and tracking 1.1. employ {non_deterministic_intelligent_algorithms} for {by-passing_aircraft_detection_tracking} to accurately identify and track the movements of by-passing aircraft based on their {by-passing_aircraft_motion_pattern}. 2. collision threat assessment 2.1. analyse collected {visual_information} to evaluate potential {collision_threat} posed by detected by-passing aircraft.	**appreciation goal 1:** the {active_avp} acknowledges the contextual constraints and potential limitations of visual data obtained from imaging sensors {own_aircraft_camera}, ensuring accurate perception and interpretation. **appreciative actions 1:** 1. comprehensive airspace monitoring: actively scan and track {by-passing_aircraft_position} using {own_aircraft_radar}, {own_aircraft_lidar}, and {own_aircraft_camera} to detect presence and movement. 2. visual data analysis: process and evaluate

facilitates a comprehensive understanding of {surrounding_airspace_safety}, allowing pilots to navigate dynamic airspace conditions with heightened confidence and efficiency.	2.2. assess risk factors including {by-passing_aircraft_speed}, {by-passing_aircraft_direction}, {by-passing_aircraft_altitude}, and {by-passing_aircraft_proximity} to determine the likelihood of an impending collision. 3. threat prediction modelling 3.1. utilize {threat_predictive_model} to forecast the future {by-passing_aircraft_position} and assess the {risk_of_potential_collision}, allowing proactive avoidance strategies. 4. cockpit display integration 4.1. continuously update {cockpit_display_systems} with real-time information about {surrounding_airspace_safety}, ensuring that {by-passing_aircraft_position} and {by-passing_aircraft_speed} are clearly visualized for the pilot. 5. pilot awareness and alert system 5.1. provide visual and/or audible alerts to enhance {own_aircraft_pilot_situation_awareness},	{visual_information} captured by {own_aircraft_camera} for accurate object detection. 3. object detection: identify and classify by-passing aircraft {by-passing_aircraft_position} based on visual cues. 4. environmental context assessment: evaluate external factors influencing {visual_information} acquisition conditions. 5. obstruction identification: detect {environmental_obstructions} such as {fog}, {raindrops}, {cloud_cover}, {cloud_type}, and {cloud_turbulence} that may impair visibility.

	ensuring that any significant changes in {by-passing_aircraft_position} or potential {collision_threat} are promptly communicated. 6. critical collision alerts 6.1. in the event of a detected {collision_threat}, issue immediate alerts to the {own_aircraft_pilot_situation_awareness}, delivering concise information regarding the nature and location of the threat. 6.2. ensure seamless integration of alerts with {aircrafts_existing_warning_systems} for a synchronized response mechanism. 7. avoidance strategy generation 7.1. generate {avoidance_strategy_recommendation} based on comprehensive analysis of {surrounding_airspace_safety} and detected {collision_threat}, providing structured advisories for {own_aircraft_pilot_situation_awareness}. 8. manoeuver recommendations	6. landscape influence evaluation: assess the impact of {landscape_background} on the readability and detectability of {visual_information} in dynamic airspace conditions. 7. daytime influence on imaging: consider the effect of {daytime} and {sunlight} levels on image clarity and sensor performance. 8. sun position impact: analyze {sun_position} relative to {own_aircraft_camera} direction, affecting the {active_avp} model's ability to perform {by-

	8.1. provide clear and actionable {avoidance_strategy_recommendation}, including: 8.1.1. {own_aircraft_roll_change} 8.1.2. {own_aircraft_pitch_change} 8.1.3. {own_aircraft_yaw_change} 8.1.4. adjustments in {own_aircraft_altitude} and {own_aircraft_speed} to mitigate collision risks effectively. 9. pilot-friendly guidance delivery 9.1. ensure that all {avoidance_strategy_recommendation} are presented in a clear, intuitive, and actionable format, allowing the {own_aircraft_pilot_situation_awareness} to interpret and execute the recommended actions efficiently. 10. seamless system integration 10.1. facilitate the integration of the {active_avp} into the {own_aircraft_pilot_decision_making_process},	passing_aircraft_detection _tracking} accurately. **appreciation goal 2:** the perception system aims to understand and evaluate the position, trajectory, and speed of by-passing aircraft, ensuring accurate detection and risk assessment. this involves analyzing {by-passing_aircraft_motion_pattern}, {by-passing_aircraft_position}, and {by-passing_aircraft_speed} to support collision avoidance strategies. **appreciative actions 2:** 1. motion pattern analysis: examine {by-passing_aircraft_motion_p

	ensuring that ai-driven recommendations complement the pilot's cognitive workload rather than adding complexity. 11. decision-making enhancement 11.1. structure {avoidance_strategy_recommendation} to enhance {own_aircraft_pilot_situation_awareness}, enabling pilots to make informed, timely, and safe decisions under various operational conditions. 12. dynamic environmental adaptation 12.1. issue {avoidance_strategy_recommendation} that dynamically guides the {own_aircraft_pilot_decision_making_process} in response to real-time changes in {surrounding_airspace_safety}. 13. situational awareness optimization 13.1. alert the {own_aircraft_pilot_situation_awareness} to any significant environmental changes	attern} to identify movement trends. 2. situation tracking: continuously monitor {by-passing_aircraft_position} for real-time awareness. 3. future position prediction: forecast {by-passing_aircraft_position} based on current dynamics. 4. speed assessment: evaluate {by-passing_aircraft_speed} to determine motion characteristics. 5. trajectory evaluation: analyze {by-passing_aircraft_flight_path} to predict potential flight maneuvers.

	affecting {surrounding_airspace_safety}, ensuring optimal pilot responsiveness to emerging threats.	6. collision impact forecasting: compute {collision_time} to anticipate possible conflicts and response timelines. **appreciation goal 3:** the perception system aims to understand and evaluate the current flight path and trajectory of the own aircraft, ensuring accurate situational awareness and decision-making. **appreciative actions 3:** 1. flight path monitoring: continuously track the {own_aircraft_flight_path} for real-time trajectory awareness.

		2. trajectory analysis: assess the {own_aircraft_flight_path} to predict movement patterns. 3. manoeuvrability assessment: evaluate {own_aircraft_flight_maneuvers} and their impact on {visual_information}. 4. speed impact evaluation: analyze {own_aircraft_speed} to determine its effect on {visual_information} accuracy. 5. response time assessment: measure {own_aircraft_response_time} to optimize reaction efficiency.

		6. maneuver recommendation: identify appropriate {own_aircraft_flight_maneuvers} for safe navigation. 7. safety evaluation: ensure {own_aircraft_flight_path} adjustments align with collision avoidance and flight safety standards. perception system appreciation of own_aircraft_pilot_decision_making_process: **appreciation goal 4:** ensure the {active_avp} recognizes and integrates human pilot validation feedback to enhance decision accuracy and identification reliability.

		appreciative actions 4: 1. incorporate {own_aircraft_pilot_feedback} into {avp_real_time_training} to continuously refine the {active_avp} model for improved real-time decision-making.

step 8: predicted problem domain factors or features (with repetition)

factors or features that manifest avp influence goal:

['active_avp', 'own_aircraft_pilot_decision_making_process', 'active_avp', 'own_aircraft_pilot_situation_awareness', 'active_avp', 'surrounding_airspace_safety']

factors or features that manifest avp control goal:

['active_avp', 'avoidance_strategy_recommendation', 'own_aircraft_pilot_decision_making_process', 'non_deterministic_intelligent_algorithms', 'by-passing_aircraft_detection_tracking', 'by-passing_aircraft_motion_pattern', 'visual_information', 'collision_threat', 'by-passing_aircraft_speed', 'by-passing_aircraft_direction', 'by-passing_aircraft_altitude', 'by-passing_aircraft_proximity', 'threat_predictive_model', 'by-passing_aircraft_position', 'risk_of_potential_collision', 'cockpit_display_systems', 'surrounding_airspace_safety', 'by-passing_aircraft_position', 'by-passing_aircraft_speed', 'own_aircraft_pilot_situation_awareness', 'by-passing_aircraft_position', 'collision_threat', 'collision_threat',

'own_aircraft_pilot_situation_awareness', 'aircrafts_existing_warning_systems', 'avoidance_strategy_recommendation', 'surrounding_airspace_safety', 'collision_threat', 'own_aircraft_pilot_situation_awareness', 'avoidance_strategy_recommendation', 'own_aircraft_roll_change', 'own_aircraft_pitch_change', 'own_aircraft_yaw_change', 'own_aircraft_altitude', 'own_aircraft_speed', 'avoidance_strategy_recommendation', 'own_aircraft_pilot_situation_awareness', 'active_avp', 'own_aircraft_pilot_decision_making_process', 'avoidance_strategy_recommendation', 'own_aircraft_pilot_situation_awareness', 'avoidance_strategy_recommendation', 'own_aircraft_pilot_decision_making_process', 'surrounding_airspace_safety', 'own_aircraft_pilot_situation_awareness', 'surrounding_airspace_safety']

factors or features that manifest avp appreciation goal:

['active_avp', 'own_aircraft_camera', 'by-passing_aircraft_position', 'own_aircraft_radar', 'own_aircraft_lidar', 'own_aircraft_camera', 'visual_information', 'own_aircraft_camera', 'by-passing_aircraft_position', 'visual_information', 'environmental_obstructions', 'fog', 'raindrops', 'cloud_cover', 'cloud_type', 'cloud_turbulence', 'landscape_background', 'visual_information', 'daytime', 'sunlight', 'sun_position', 'own_aircraft_camera', 'active_avp', 'by-passing_aircraft_detection_tracking', 'by-passing_aircraft_motion_pattern', 'by-passing_aircraft_position', 'by-passing_aircraft_speed', 'by-passing_aircraft_motion_pattern', 'by-passing_aircraft_position', 'by-passing_aircraft_position', 'by-passing_aircraft_speed', 'by-passing_aircraft_flight_path', 'collision_time', 'own_aircraft_flight_path', 'own_aircraft_flight_path', 'own_aircraft_flight_maneuvers', 'visual_information', 'own_aircraft_speed', 'visual_information', 'own_aircraft_response_time', 'own_aircraft_flight_maneuvers', 'own_aircraft_flight_path', 'active_avp', 'own_aircraft_pilot_feedback', 'avp_real_time_training', 'active_avp']

step 2: observed system (obs)	**step 3: observed action**	**step 4: supra source primary purpose**
by-passing aircraft {by-passing_aircraft}	the by-passing aircraft is in constant motion, following a flight path that intersects with that of own aircraft.	by-passing aircraft aims to be capable of disrupting air traffic system
step 5: auxiliary influence interaction	**step 6: auxiliary control interaction**	**step 7: auxiliary appreciation interaction**

Influence Goal	**Control Goal**	**Appreciation Goal**
The {by-passing_aircraft_proximity} to the {stabilised_own_aircraft_dynamics} can trigger {conflicted_atc} to issue {emergency_directives} and {rerouting_instructions}, affecting not only the ownship but also other aircraft {other_aircrafts} in the vicinity. **Influence Actions** 1. Maintain constant motion at a stable {by-passing_aircraft_speed}. 2. Intersect with the {own_aircraft_flight_path}, creating potential navigational conflicts. 3. Approach the ownship aircraft at an {unsafe_proximity}, increasing collision risk. 4. Manoeuvre unpredictably, leading to potential {airspace_conflicts}.	Manipulate the {collision_avoidance_system} and the {own_aircraft_pilot_decision_making_process} to influence decision-making and flight path adjustments under high-risk conditions. **Control Actions** 1. Triggering Collision Avoidance Systems & Pilot Response 1.1. Activate the {collision_avoidance_system} aboard the own aircraft, compelling an automatic course alteration. 1.2. Induce rapid, stress-induced decisions ({pilot_stress}) by forcing the pilot into high-pressure scenarios. 2. Ensuring Continuous Detection & Conflict Awareness 2.1. Maintain {by-passing_aircraft_speed} within {radar_and_visual_range} to ensure persistent {by-passing_aircraft_visibility} for both	The {by-passing_aircraft_dynamics} must appreciate and adapt to the {stabilised_own_aircraft_dynamics}, ensuring alignment with the {collision_avoidance_system}, {own_aircraft_pilot_decision_making_process}, and {weather_data}. **Appreciation Actions** 1. Environmental Awareness: 1.1 Regularly assess {weather_data} to evaluate the impact of {airspace_visibility}, {wind}, and {cloud_turbulence} on {active_avp} aboard {stabilised_own_aircraft_dynamics

5. Induce {conflicted_atc} to issue {rerouting_instructions} impacting multiple aircraft {other_aircrafts}.	{conflicted_atc} and the {collision_avoidance_system}. 3. Flight Path Interference & Conflict Creation 3.1. Manoeuvre to intersect or closely align with the {own_aircraft_flight_path}, disrupting {stabilised_own_aircraft_dynamics} and generating an unavoidable conflict scenario. 3.2. Reduce distance between the by-passing aircraft ({by-passing_aircraft_proximity}) and the {stabilised_own_aircraft_dynamics}, heightening the perceived threat. 4. Forcing Avoidance System Activation 4.1. Engage in deliberate flight actions that trigger the {collision_avoidance_system} of the {stabilised_own_aircraft_dynamics}, ensuring forced response. 5. Inducing Attention & Stress Through Unpredictable Behavior 5.1. Utilize irregular or unpredictable flight patterns ({unpredictable_by-passing_aircraft_actions}) to demand heightened focus from	} and {by-passing_aircraft_dynamics}. 1.2 Determine how {weather_data} affects {by-passing_aircraft_proximity}, ensuring optimal {by-passing_aircraft_visibility} for the {stabilised_own_aircraft_dynamics}. 2. System Threshold Exploitation: 2.1 Gain insight into {avp_confidence_threshold} by influencing {active_avp} through {by-passing_aircraft_hack_avp_threshold}. 2.2 Assess the impact of {by-passing_aircraft_hack_avp_threshold} on

	{conflicted_atc} and {own_aircraft_pilot_decision_making_process}. 5.2. Through these {unpredictable_by-passing_aircraft_actions}, compel the {own_aircraft_pilot_decision_making_process} to make rapid, high-stress decisions ({pilot_stress}) under immediate threat conditions.	{collision_avoidance_system}, ensuring that maneuvers effectively trigger {active_avp}.

step 8: predicted problem domain factors or features (with repetition)

factors or features that manifest by-passing aircraft influence goal.

['by-passing_aircraft_proximity', 'stabilised_own_aircraft_dynamics', 'conflicted_atc', 'emergency_directives', 'rerouting_instructions', 'other_aircrafts', 'by-passing_aircraft_speed', 'own_aircraft_flight_path', 'unsafe_proximity', 'airspace_conflicts', 'conflicted_atc', 'rerouting_instructions', 'other_aircrafts']

factors or features that manifest by-passing aircraft control goal.

['collision_avoidance_system', 'own_aircraft_pilot_decision_making_process', 'collision_avoidance_system', 'pilot_stress', 'by-passing_aircraft_speed', 'radar_and_visual_range', 'by-passing_aircraft_visibility', 'conflicted_atc', 'collision_avoidance_system', 'own_aircraft_flight_path', 'stabilised_own_aircraft_dynamics', 'by-passing_aircraft_proximity', 'stabilised_own_aircraft_dynamics', 'collision_avoidance_system', 'stabilised_own_aircraft_dynamics', 'unpredictable_by-passing_aircraft_actions', 'conflicted_atc', 'own_aircraft_pilot_decision_making_process', 'unpredictable_by-passing_aircraft_actions', 'own_aircraft_pilot_decision_making_process', 'pilot_stress']

factors or features that manifest by-passing aircraft appreciation goal.

['by-passing_aircraft_dynamics', 'stabilised_own_aircraft_dynamics', 'collision_avoidance_system', 'own_aircraft_pilot_decision_making_process', 'weather_data', 'weather_data', 'airspace_visibility', 'wind', 'cloud_turbulence', 'active_avp', 'stabilised_own_aircraft_dynamics', 'by-passing_aircraft_dynamics', 'weather_data', 'by-passing_aircraft_proximity', 'by-passing_aircraft_visibility', 'stabilised_own_aircraft_dynamics', 'avp_confidence_threshold', 'active_avp', 'by-passing_aircraft_hack_avp_threshold', 'by-passing_aircraft_hack_avp_threshold', 'collision_avoidance_system', 'active_avp']		
step 2: observed system (obs)	**step 3: observed action**	**step 4: supra source primary purpose**
ownship aircraft: {stabilised_own_aircraft_dynamics}	action: encountering, avoiding, and detecting by-passing aircraft	maintain safe and secure air-travel
step 5: auxiliary influence interaction	**step 6: auxiliary control interaction**	**step 7: auxiliary appreciation interaction**
influence goal: the {stabilised_own_aircraft_dynamics} seeks to maintain a safe distance {own_aircraft_proximity} from all other aircraft {other_aircrafts}, particularly those identified as potential threats, thereby contributing to the overall safety of the {surrounding_airspace_safety}. **Influence actions:**	**control goal :** to prevent collisions {collision_avoidance} with by-passing aircraft {by-passing_aircraft_position}. **control actions:** 1. adjust flight path: o recalculate the current flight trajectory {own_aircraft_flight_path}. o implement rerouting decisions {automated_own_aircraft_flight_path_change}., {own_aircraft_altitude_change}	**appreciation goal:** the {stabilised_own_aircraft_dynamics} needs to recognize and adapt to external factors or features and dynamics {weather_conditions}, {surrounding_airspace_obstructions} in the airspace that are beyond its direct control but which critically influence its ability to

1. adjust {own_aircraft_flight_management_system}: adjust the flight plan and path {own_aircraft_flight_path} in response to the threat for maintaining safe separation. 2. autonomously execute manoeuvres for {autonomous_collision_avoidance_maneuvers} based on input from other systems. 3. alerting and warning {own_aircraft_pilot_decision_making_process}: provide the pilots with immediate alerts {potential_collision_threat_alert} regarding the proximity of the {by-passing_aircraft_position}.	2. manage aircraft movement {disturbed_own_aircraft_dynamics}.: o accelerate or decelerate to change speed {own_aircraft_speed_change}. o execute evasive maneuvers promptly {accelerated_own_aircraft_dynamics}. o stabilize the flight dynamics {stabilised_own_aircraft_dynamics} post manoeuvre. 3. control flight attitude: o adjust pitch {own_aircraft_pitch_change}, {own_aircraft_roll_change}, and {own_aircraft_yaw_change}for manoeuvring. {accelerated_own_aircraft_roll}, {accelerated_own_aircraft_pitch}, {accelerated_own_aircraft_yaw} o maintain balance during abrupt changes. o align with new flight path post manoeuvre. 4. engage {own_aircraft_flight_management_system} for controlled adjustments: o activate {own_aircraft_flight_management_system} for	avoid collisions and maintain safe separation. **appreciative actions:** 1. for adjust own_aircraft_flight_management_system: o appreciate weather patterns {weather_conditions}: understand and anticipate how changing {weather_conditions_change} can affect {weather_data_change} which impact flight automated paths and maneuvers {own_aircraft_flight_path_change}, {own_aircraft_dynamics_change}. o monitor air traffic

	precise navigation adjustments. o monitor {own_aircraft_flight_management_system} performance during manoeuvres. o override {own_aircraft_flight_management_system_override} if manual control is deemed necessary. 5. operate {pilot_alerting_and_warning_systems}: o acknowledge and respond to alerts {collision_threat_alert}. o evaluate the proximity of {by-passing_aircraft_proximity}. o prepare for immediate manual intervention if required {manual_own_aircraft_flight_path_change}.	control: stay informed about {conflicted_atc} instructions and advisories that might affect the flight plan and path {own_aircraft_flight_path_change}. 2. to execute avoidance manoeuvres: o recognize nearby aircraft actionss {other_aircrafts}: o be aware of the unpredictable movements and decisions {unpredictable_other_aircrafts_decision} of nearby aircraft which might necessitate sudden {automated_collision_avoidance_maneuvers}. o acknowledge avp limitations: understand the limitations of {active_avp}

		in complex and rapidly changing situations. 3. for alerting and warning pilot: o consider communication delays: factors or feature in potential delays in {avp_detection_communication_delay_hack} which might impact the timeliness of alerts. o understand {own_aircraft_pilot_decision_making_process}: recognize the pilot's workload and cognitive limitations {pilot_cognitive_limit} while presenting alerts {collision_threat_alert} to ensure an effective response.

		4. for adjust flight path: o monitor airspace restrictions {surrounding_airspace_restrictions}: stay updated on temporary airspace restrictions or zones [like military exercises, restricted areas] {military_aircraft_intrusion} which could necessitate rerouting. 5. to manage aircraft movement: acknowledge airspace congestion: understand the impact of {surrounding_airspace_obstructions} {other_aircrafts_presence} on the ability to execute evasive manoeuvres or speed adjustments.

		recognize the impact of environmental factors or features: be aware of how environmental factors or features like {bird} activity or {drone_presence} might necessitate rapid movement changes. 6. for control flight attitude: o appreciate external forces: understand the impact of external forces like {wind_shear_effect_on_camera} or air density {air_density_change_due_to_high_speed_effect_on_camera} also on {aircraft_attitude_control}. o monitor {mechanical_wear_and_tear}: stay aware of the aircraft's mechanical

		condition which can affect the responsiveness to attitude adjustments. 7. for engage {own_aircraft_flight_management_system} for controlled adjustments: o consider system failures: be prepared for potential {autopilot_system_failure} or malfunctions and have contingency plans. o understand airspace complexity: recognize the limitations of {active_avp} in highly complex airspace scenarios. for operate {pilot_alerting_and_warning_systems}: be aware of system overload: recognize the risk of alert fatigue or

		{information_overload_for_pilot} during high stress events {highly_stressfull_event} and design alerts accordingly.

step 8: predicted problem domain factors or features (with repetition)

factors or features that manifest own aircraft influence goal

['stabilised_own_aircraft_dynamics', 'own_aircraft_proximity', 'other_aircrafts', 'surrounding_airspace_safety', 'own_aircraft_flight_management_system', 'own_aircraft_flight_path', 'autonomous_collision_avoidance_maneuvers', 'own_aircraft_pilot_decision_making_process', 'potential_collision_threat_alert', 'by-passing_aircraft_position']

factors or features that manifest own aircraft control goal.

['collision_avoidance', 'by-passing_aircraft_position', 'own_aircraft_flight_path', 'automated_own_aircraft_flight_path_change', 'own_aircraft_altitude_change', 'disturbed_own_aircraft_dynamics', 'own_aircraft_speed_change', 'accelerated_own_aircraft_dynamics', 'stabilised_own_aircraft_dynamics', 'own_aircraft_pitch_change', 'own_aircraft_roll_change', 'own_aircraft_yaw_change', 'accelerated_own_aircraft_roll', 'accelerated_own_aircraft_pitch', 'accelerated_own_aircraft_yaw', 'own_aircraft_flight_management_system', 'own_aircraft_flight_management_system', 'own_aircraft_flight_management_system', 'own_aircraft_flight_management_system_override', 'pilot_alerting_and_warning_systems', 'collision_threat_alert', 'by-passing_aircraft_proximity', 'manual_own_aircraft_flight_path_change']

factors or features that manifest own aircraft appreciation goal.

['stabilised_own_aircraft_dynamics', 'weather_conditions', 'surrounding_airspace_obstructions', 'weather_conditions', 'weather_conditions_change', 'weather_data_change', 'own_aircraft_flight_path_change', 'own_aircraft_dynamics_change', 'atc', 'own_aircraft_flight_path_change', 'other_aircrafts', 'unpredictable_other_aircrafts_decision', 'automated_collision_avoidance_maneuvers', 'avp', 'avp_detection_communication_delay_hack',

```
'own_aircraft_pilot_decision_making_process', 'pilot_cognitive_limit', 'collision_threat_alert',
'surrounding_airspace_restrictions', 'military_aircraft_intrusion', 'surrounding_airspace_obstructions',
'other_aircrafts_presence', 'bird', 'drone_presence', 'wind_shear_effect_on_camera',
'air_density_change_due_to_high_speed_effect_on_camera', 'aircraft_attitude_control', 'mechanical_wear_and_tear',
'own_aircraft_flight_management_system', 'autopilot_system_failure', 'avp', 'pilot_alerting_and_warning_systems',
'information_overload_for_pilot', 'highly_stressfull_event']
```

K.2 Predictive Thinking Pipeline 4: Predict and Evaluate Problem Domain Factors and Assumptions.

K.2.1 Step 4.1) Perform the most and least frequent factor evaluation

To perform this analysis, we needed to extract all the factors mentioned above and count their frequencies. The frequency of mention indicates the degree of emphasis we place on their influence on our peripheral perception of the problem. The following is Python code that we used to do so:

```
import csv
from collections import Counter


def extract_text_in_parentheses():
"""
This code accepts text of any length and searches for specific characters to extract the text located between those characters. We employ the following format to define interactions:
```

({roaming_adversarial_drone}_[appreciate]_{powered_powerlines_structure}), where a factor is defined within curly braces {} and an action is enclosed within square brackets []. This script has been utilised to extract the factors and compile them into a list. Please execute this script in a local Python environment.

```
"""
  # Prompt the user to enter a text
  input_text = input("enter your text: ")

  # List to store extracted phrases
  extracted_phrases = []

  # Temporary string to build phrases
  temp_phrase = ""
  inside_parentheses = False

  # Iterate through each character in the text
  for char in input_text:
    if char == '{': # choose the opening character
      inside_parentheses = True
      temp_phrase = ""
```

```
    elif char == '}' and inside_parentheses: # choose the closing character
        inside_parentheses = False
        # Add the phrase to the list
        extracted_phrases.append(temp_phrase)
    elif inside_parentheses:
        temp_phrase += char

  return extracted_phrases

predicted_factors = extract_text_in_parentheses()
print("----------------------------------------------------------------")
print("----------------------------------------------------------------")
print("----------------------------------------------------------------")
print("----------------------------------------------------------------")
print(predicted_factors)

def generate_histogram_and_csv(data_list):
  # Count the frequency of each element in the list
  frequency_count = Counter(data_list)
```

```
# Calculate total occurrences for influence level calculation
total_occurrences = sum(frequency_count.values())

# Create a list of dictionaries for CSV writing
csv_data = []
for factor, freq in frequency_count.items():
    influence_level = freq / total_occurrences
    csv_data.append({
        "Predicted Factor": factor,
        "Frequency": freq,
        "Influence Level": influence_level
    })

# Sort the list by frequency in descending order
csv_data.sort(key=lambda x: x["Frequency"], reverse=True)

# Write data to CSV file
with open(r'C:\Users\hal1e20\python_ver\python_projects\Systems_Science\predicted_factors.csv', 'w', newline='') as file:
    writer = csv.DictWriter(file, fieldnames=["Predicted Factor", "Frequency", "Influence Level"])
    writer.writeheader()
```

```
    writer.writerows(csv_data)


  return r"C:\Users\hal1e20\python_ver\python_projects\Systems_Science\predicted_factors.csv"


# Example usage with a list of elements
#example_data = ["factor1", "factor2", "factor1", "factor3", "factor2", "factor1"]
#csv_file_path = generate_histogram_and_csv(example_data)
csv_file_path = generate_histogram_and_csv(predicted_factors)


print(csv_file_path) # output the location of the CSV file that compute the frequency of factors during analysis
```

K.2.2 Step 4.3) Define the assumptions made about factors

Table K.2: AVOID Problem Domain Factors, Assumptions and Hazards.

Factor	definition	so what? assumption
active_avp	A system designed to enhance the pilot's awareness and decision-making process by providing alerts and recommendations based on the surrounding environment and potential threats.	The AVP system will always provide timely and accurate alerts and recommendations to the pilot.
stabilised_own_aircraft_dynamics	The situation of the aircraft where its flight dynamics (e.g., speed, altitude, direction) are stable and under control.	The aircraftâ€™s dynamics will remain stable and within the controllable limits set by the AVP system during flight.
own_aircraft_pilot_decision_making_process	The process through which the pilot makes decisions based on various inputs, including alerts from the AVP system, situational awareness, and environmental conditions.	The pilot will never over-rely on the perception systemâ€™s judgment, maintaining normal vigilance during flight.
by-passing_aircraft_position	The location of an aircraft not part of the own fleet, potentially posing a collision risk.	The by-passing aircraftâ€™s position will always be accurately detected and tracked by the AVP system.
own_aircraft_pilot_situation_awareness	The pilotâ€™s understanding and perception of the current situation and environment around the aircraft.	The pilot will maintain high situational awareness at all times, regardless of the complexity of the flight environment.
own_aircraft_flight_path	The trajectory or route that the own aircraft is following or plans to follow.	The aircraft will always follow the planned flight path unless instructed otherwise by ATC or the AVP system.
surrounding_airspace_safety	The safety status of the airspace around the aircraft, including the presence of	The surrounding airspace will always be monitored effectively, ensuring up-to-date and accurate information.

	other aircraft and environmental conditions.	
avoidance_strategy_recommendation	Suggestions provided by the AVP system on how to maneuver to avoid potential collisions.	The AVP system will provide accurate and timely avoidance strategy recommendations at all times.
visual_information	Data collected from visual sensors like cameras, providing imagery or video of the aircraft's surroundings.	The visual information will always be clear and free from obstructions or environmental interferences.
by-passing_aircraft_speed	The velocity at which a by-passing aircraft is moving.	The AVP system will accurately measure and track the speed of by-passing aircraft at all times.
collision_avoidance_system	An onboard system designed to prevent collisions by detecting and alerting pilots of potential threats.	The collision avoidance system will always detect potential collision threats accurately and promptly.
by-passing_aircraft_proximity	The closeness or distance of a by-passing aircraft to the own aircraft.	The AVP system will accurately measure and maintain a safe proximity between the own aircraft and by-passing aircraft.
conflicted_atc	Air traffic control providing directions to aircraft; may give conflicting instructions.	ATC will always provide timely and accurate instructions to manage aircraft separation and safety.
own_aircraft_flight_management_system	An integrated onboard computer system that manages key flight parameters.	The flight management system will always operate correctly and manage the flight parameters as planned.
collision_threat	A situation where there is a high risk of the aircraft colliding with another object or aircraft.	All collision threats will be detected and addressed promptly by the AVP system and the pilot.
own_aircraft_camera	Cameras mounted on the aircraft to capture visual information of surroundings.	The cameras will always provide clear and reliable visual information, regardless of environmental conditions.
other_aircrafts	Other aircraft present in the vicinity of the own aircraft.	The AVP system will detect and track all other aircraft in the vicinity accurately.

by-passing_aircraft_motion_pattern	The pattern or behavior of movement of a by-passing aircraft, including changes in speed and direction.	The AVP system will accurately predict and monitor the motion patterns of by-passing aircraft.
weather_data	Information related to weather conditions like wind, visibility, and turbulence.	The AVP system will always have access to accurate and up-to-date weather data.
by-passing_aircraft_detection_tracking	The process of identifying and continuously monitoring the position and movement of by-passing aircraft.	The AVP system will continuously and accurately track the position and movement of by-passing aircraft.
own_aircraft_roll_change	Adjustments in the aircraft's roll (lateral rotation) for manoeuvring.	The AVP system will accurately recommend roll changes and the aircraft will execute them effectively.
own_aircraft_pitch_change	Adjustments in the aircraft's pitch (vertical rotation) for maneuvering.	The AVP system will accurately recommend pitch changes, and the aircraft will execute them effectively.
own_aircraft_yaw_change	Adjustments in the aircraft's yaw (horizontal rotation) for maneuvering.	The AVP system will accurately recommend yaw changes, and the aircraft will execute them effectively.
own_aircraft_speed	The velocity at which the own aircraft is moving.	The AVP system will accurately measure and adjust the aircraft's speed as needed.
cloud_turbulence	Atmospheric turbulence associated with certain types of clouds, affecting flight stability.	The AVP system will accurately detect and account for cloud turbulence, ensuring stable flight operations.
own_aircraft_flight_maneuvers	Various actions taken by the aircraft to change its flight path, speed, or orientation.	The AVP system will recommend appropriate flight maneuvers, and the aircraft will execute them effectively.
rerouting_instructions	Directions provided by ATC or the flight management system to change the current flight path for safety.	The AVP system will effectively communicate rerouting instructions to the pilot and ATC.
pilot_stress	The level of psychological pressure or stress experienced by the pilot,	The pilot will maintain composure and effectively manage stress during high-pressure situations.

	particularly in emergency or demanding situations.	
by-passing_aircraft_visibility	The ability of the AVP system and the pilot to visually detect a by-passing aircraft.	The AVP system will always ensure clear visibility of by-passing aircraft.
unpredictable_by-passing_aircraft_actions	Erratic or non-standard movements of a by-passing aircraft that complicate detection and avoidance strategies.	The AVP system will accurately predict and respond to unpredictable by-passing aircraft behaviour.
by-passing_aircraft_dynamics	The characteristics of the by-passing aircraft's movement, including speed, altitude, and trajectory.	The AVP system will continuously and accurately track the dynamics of by-passing aircraft.
by-passing_aircraft_hack_avp_threshold	An attempt to manipulate or interfere with the AVP system's thresholds or parameters.	The AVP system will be secure against hacking attempts that aim to manipulate its thresholds or parameters.
pilot_alerting_and_warning_systems	Systems designed to alert the pilot about potential threats or necessary actions.	The alerting and warning systems will always function correctly and provide timely alerts.
collision_threat_alert	An alert issued when there is an imminent risk of collision.	The AVP system will always issue timely and accurate collision threat alerts.
weather_conditions	The current situation of the weather, including factors like wind, visibility, clouds, and turbulence.	The AVP system will always have accurate and up-to-date weather condition information.
surrounding_airspace_obstructions	Physical or environmental obstacles in the airspace around the aircraft.	The AVP system will always detect and account for all obstructions in the surrounding airspace.
own_aircraft_flight_path_change	Adjustments made to the original flight path of the aircraft.	The AVP system will recommend necessary flight path changes, and the aircraft will execute them effectively.

non_deterministic_intelligent_algorithms	Algorithms used in AVP systems that provide outputs not strictly determined by their inputs, often used for complex decision-making processes.	The AVP systemâ€™s algorithms will always provide reliable and accurate outputs.
by-passing_aircraft_direction	The course or path along which a by-passing aircraft is moving.	The AVP system will accurately track the direction of by-passing aircraft at all times.
by-passing_aircraft_altitude	The height above ground or sea level at which a by-passing aircraft is flying.	The AVP system will accurately measure and track the altitude of by-passing aircraft at all times.
41. aircrafts_existing_warning_systems	pre-existing systems in the aircraft designed to warn the pilot of various threats or necessary actions.	the existing warning systems will always function correctly and provide timely alerts.
42. own_aircraft_yaw_change	adjustments in the aircraft's yaw {horizontal rotation} for maneuvering.	the avp system will accurately recommend yaw changes, and the aircraft will execute them effectively.
43. own_aircraft_altitude	the height at which the own aircraft is flying above ground or sea level.	the avp system will accurately measure and maintain the aircraft's altitude.
44. own_aircraft_radar	radar systems on the aircraft used for detecting other objects and aircraft in the vicinity.	the radar system will always accurately detect and track objects and other aircraft.
45. own_aircraft_lidar	lidar systems on the aircraft used for measuring distances and detecting objects by illuminating the target with laser light.	the lidar system will always provide accurate distance measurements and object detection.
46. environmental_obstructions	physical or atmospheric conditions that hinder visibility or the operation of sensors.	the avp system will always detect and account for all environmental obstructions.
47. fog	a weather condition that reduces visibility, potentially impacting sensor performance.	the avp system will effectively account for and mitigate the effects of fog on sensor performance.

48. raindrops	precipitation that can interfere with sensor accuracy and visibility.	the avp system will effectively account for and mitigate the effects of raindrops on sensor performance.
49. cloud_cover	the fraction of the sky covered by clouds, which can affect visibility and sensor operation.	the avp system will effectively account for and mitigate the effects of cloud cover on sensor performance.
50. cloud_type	the classification of clouds based on their appearance and altitude, impacting visibility and flight conditions.	the avp system will always accurately identify and account for different cloud types.
51. cloud_turbulance	atmospheric turbulence associated with certain types of clouds, affecting flight stability.	the avp system will accurately detect and account for cloud turbulence, ensuring stable flight operations.
52. landscape_background	the terrain and features in the background that could affect sensor readings and visibility.	the avp system will effectively differentiate between concerning objects and the landscape background, ensuring accurate sensor readings.
53. daytime	the time during the day, affecting lighting conditions and thus sensor performance.	the avp system will adapt to different lighting conditions throughout the day, maintaining effective sensor performance.
54. sunlight	natural light from the sun, influencing visibility and the effectiveness of visual sensors.	the avp system will mitigate the effects of sunlight glare and changes in natural lighting on sensor performance.
55. sun_position	the location of the sun in the sky, which can impact sensor performance and pilot visibility.	the avp system will accurately account for the sun's position, ensuring effective sensor performance and pilot visibility.
56. own_camera	cameras installed on the aircraft used to capture visual information.	the cameras will always provide clear and reliable visual information,

		regardless of environmental conditions.
57. by-passing_aircraft_flight_path	the trajectory or route followed by an by-passing aircraft.	the avp system will accurately track and predict the flight path of by-passing aircraft at all times.
58. collision_time	the estimated time remaining before a potential collision could occur.	the avp system will accurately calculate the collision time, providing timely alerts and recommendations.
59. own_aircraft_response_time	the time it takes for the own aircraft to respond to control inputs or system commands.	the avp system will ensure minimal response time for control inputs and commands.
60. own_aircraft_pilot_feedback	input or reactions from the pilot in response to the system's performance or alerts.	the pilot will provide accurate and timely feedback to the avp system, enhancing its performance.
61. avp_real_time_training	the process of continuously updating and improving the avp system based on real-time data and pilot feedback.	the avp system will continuously and effectively update its algorithms based on real-time data and pilot feedback.
62. emergency_directives	urgent instructions issued in response to critical situations, such as potential collisions.	the avp system will always issue clear and effective emergency directives in a timely manner.
63. unsafe_proximity	a distance between two aircraft that is considered dangerously close.	the avp system will accurately detect and alert the pilot to any unsafe proximity situations.
64. airspace_conflicts	situations where the paths of multiple aircraft intersect, creating a risk of collision.	the avp system will accurately predict and manage airspace conflicts.
65. radar_and_visual_range	the range within which objects can be detected either by radar or visually.	the avp system will effectively utilize radar and visual data to detect objects within range.
66. airspace_visibility	the clarity of the airspace, affecting the ability to visually detect other aircraft.	the avp system will always ensure clear visibility and detectability of other aircraft.

67. wind	atmospheric wind conditions, which can affect flight dynamics and sensor operation.	the avp system will effectively account for and mitigate the effects of wind on flight dynamics and sensor operation.
68. cloud_turbulence	disturbances in the atmosphere associated with certain cloud formations, affecting flight stability.	the avp system will accurately detect and account for cloud turbulence, ensuring stable flight operations.
69. avp_confidence_threshold	the level of certainty at which the avp system reliably operates.	the avp system will maintain a high confidence threshold, ensuring reliable operation under various conditions.
70. by-passing_aircraft_hack_avp_threashold	an attempt to manipulate or interfere with the avp system's thresholds or parameters.	the avp system will be secure against hacking attempts that aim to manipulate its thresholds or parameters.
71. own_aircraft_proximity	the distance of the own aircraft from other objects or aircraft.	the avp system will accurately measure and maintain safe proximity from other objects and aircraft.
72. autonomous_collision_avoidance_maneuvers	maneuvers executed by the aircraft's systems without pilot input to avoid collisions.	the avp system will execute autonomous maneuvers effectively and safely.
73. potential_collision_threat_alert	a warning issued when there is a possibility of a collision.	the avp system will always issue timely and accurate collision threat alerts.
74. collision_avoidance	measures taken to prevent a collision from occurring.	the avp system will recommend and execute effective collision avoidance measures.
75. automated_own_aircraft_flight_path_change	changes to the flight path made automatically by the aircraft's systems.	the avp system will accurately and safely execute automatic flight path changes.
76. own_aircraft_altitude_change	adjustments to the altitude at which the aircraft is flying.	the avp system will accurately measure and maintain the aircraft's altitude.

77. disturbed_own_aircraft_dynamics	Changes in the aircraft's flight dynamics due to external factors or manoeuvres.	the avp system will effectively manage and compensate for disturbances in flight dynamics.
78. own_aircraft_speed_change	Adjustments in the speed at which the aircraft is flying.	the avp system will accurately measure and adjust the aircraft's speed as needed.
79. accelerated_own_aircraft_dynamics	The dynamics of the aircraft when it is accelerating or decelerating.	The AVP system will accurately monitor and manage the aircraft's acceleration and deceleration.
80. own_aircraft_yaw_change	Adjustments in the aircraft's yaw (horizontal axis rotation).	the avp system will accurately recommend yaw changes, and the aircraft will execute them effectively.
81. accelerated_own_aircraft_roll	the roll of the aircraft when it is undergoing acceleration.	the avp system will accurately monitor and manage the aircraft's roll during acceleration.
82. accelerated_own_aircraft_pitch	the pitch of the aircraft during acceleration.	the avp system will accurately monitor and manage the aircraft's pitch during acceleration.
83. accelerated_own_aircraft_yaw	the yaw of the aircraft when it is accelerating.	the avp system will accurately monitor and manage the aircraft's yaw during acceleration.
84. own_aircraft_flight_management_system_override	the ability of the pilot to manually override the automated flight management system.	the avp system will allow seamless manual override by the pilot when necessary.
85. manual_own_aircraft_flight_path_change	changes to the flight path made manually by the pilot.	the avp system will accurately account for and integrate manual flight path changes made by the pilot.
86. weather_conditions_change	variations in weather conditions that can affect flight dynamics and sensor operation.	the avp system will continuously monitor and adapt to changing weather conditions.
87. weather_data_change	alterations in the weather data being received and processed.	the avp system will ensure accurate and up-to-date weather data processing.

88. own_aircraft_dynamics_change	changes in the flight dynamics of the own aircraft due to various factors.	the avp system will effectively manage and adapt to changes in flight dynamics.
89. unpredictable_other_aircrafts_decision	erratic or unforeseen decisions made by other aircraft in the vicinity.	the avp system will anticipate and adapt to unpredictable decisions by other aircraft.
90. automated_collision_avoidance_maneuvers	manoeuvres executed automatically by the aircraft's systems to avoid collisions.	the avp system will execute automated collision avoidance maneuvers effectively and safely.
91. avp_detection_communication_delay_hack	deliberate attempts to cause delays in the avp system's detection and communication processes.	the avp system will be secure against hacking attempts that aim to cause delays in detection and communication.
92. pilot_cognitive_limit	the limitations of the pilot's ability to process information and make decisions under stress.	the avp system will effectively support the pilot, minimizing the impact of cognitive limits under stress.
93. surrounding_airspace_restrictions	limitations or prohibitions in certain areas of the airspace, affecting flight paths.	the avp system will always account for and comply with surrounding airspace restrictions.
94. military_aircraft_intrusion	the presence of military aircraft in the airspace, which can affect civil aviation operations.	the avp system will detect and account for the presence of military aircraft in the airspace.
95. other_aircrafts_presence	the presence of other aircraft in the vicinity of the own aircraft.	the avp system will continuously monitor and track other aircraft in the vicinity.
96. birds	birds activity that can pose a risk to aircraft, especially during cruise, takeoff and landing.	the avp system will detect and account for bird activity near the aircraft.
97. drone_presence	the presence of unmanned aerial vehicles {drones} in the airspace, which can pose collision risks.	the avp system will detect and account for the presence of drones in the airspace.

98. wind_shear_effect_on_camera	the impact of sudden changes in wind speed or direction on the operation of onboard cameras.	the avp system will effectively account for and mitigate the impact of wind shear on camera operation.
99. air_density_change_due_to_high_speed_effect_on_camera	the effect of changes in air density, especially at high speeds, on camera performance.	the avp system will effectively account for and mitigate the impact of air density changes on camera performance.
100. aircraft_attitude_control	the system and process of managing the orientation of the aircraft in flight.	the avp system will accurately manage and control the aircraft's attitude in various flight conditions.
101. mechanical_wear_and_tear	the degradation of aircraft components over time due to regular use.	the avp system will detect and account for mechanical wear and tear, ensuring continued safe operation.
102. autopilot_system_failure	a malfunction or failure of the aircraft's autopilot system.	the avp system will seamlessly take over in the event of an autopilot system failure.
103. information_overload_for_pilot	a situation where the pilot is presented with more information than can be effectively processed.	the avp system will prioritize and filter information to prevent pilot overload.
104. highly_stressfull_event	an event or situation that places a high level of stress on the pilot, affecting decision-making and performance.	the avp system will support the pilot effectively during highly stressful events.
predicted factor	**plausibility**	**why is it plausible or not?**
1. own_aircraft_pilot_decision_making_process	not plausible	when the system demonstrates reliable results, pilots will eventually trust it more and more, leading to overtrust.
2. by-passing_aircraft_position	not plausible	detection systems may have limitations and may not always accurately detect or track by-passing

		aircraft, especially in challenging conditions.
3. stabilised_own_aircraft_dynamics	plausible	aircraft systems are designed to maintain stable flight dynamics, and avp can assist in managing minor deviations effectively.
4. active_avp {avdds perception}	not plausible	system limitations, delays, and potential malfunctions could affect the timeliness and accuracy of alerts and recommendations.
5. own_aircraft_pilot_situation_awareness	not plausible	situational awareness can degrade due to high workload, stress, or over-reliance on automated systems.
6. surrounding_airspace_safety	plausible	current aviation systems and atc provide robust monitoring of airspace, although limitations in detection and communication can exist.
7. avoidance_strategy_recommendation	not plausible	system limitations, data processing delays, and unforeseen scenarios can affect the accuracy and timeliness of recommendations.
8. visual_information	not plausible	weather conditions, lighting, and sensor limitations can impact the quality and clarity of visual information.
9. own_aircraft_flight_path	plausible	modern flight management systems ensure adherence to planned flight paths, although deviations may occur due to unforeseen circumstances.
10. by-passing_aircraft_speed	not plausible	sensor limitations and environmental conditions can affect the accuracy of speed measurements of by-passing aircraft.

11. collision_avoidance_system	not plausible	system limitations, technical failures, and unforeseen scenarios can impact the effectiveness of the collision avoidance system.
12. collision_threat	not plausible	detection systems may not always capture all threats promptly, especially in complex or congested airspace.
13. by-passing_aircraft_proximity	not plausible	sensor limitations and environmental factors can affect the accuracy of proximity measurements.
14. atc {air traffic control}	plausible	atc systems are designed to provide accurate and timely instructions, though human and technical errors can occur.
15. own_aircraft_flight_management_system	plausible	modern flight management systems are highly reliable, though technical failures can still occur.
16. other_aircrafts	not plausible	detection limitations and data processing delays can affect the accuracy and timeliness of tracking other aircraft.
17. by-passing_aircraft_detection_tracking	not plausible	environmental conditions and sensor limitations can impact the continuous and accurate tracking of by-passing aircraft.
18. by-passing_aircraft_motion_pattern	not plausible	predicting motion patterns can be complex due to unpredictable behavior and environmental factors.
19. own_aircraft_camera	not plausible	visual quality can be compromised by weather, lighting conditions, and sensor limitations.

20. own_aircraft_roll_change	plausible	modern aircraft control systems can execute roll changes accurately based on avp recommendations, though pilot input is also crucial.
21. own_aircraft_pitch_change	plausible	modern aircraft control systems can execute pitch changes accurately based on avp recommendations, though pilot input is also crucial.
22. own_aircraft_speed	plausible	modern flight management systems can manage speed accurately, though sensor and system limitations can occur.
23. own_aircraft_flight_maneuvers	plausible	modern aircraft control systems are capable of executing complex maneuvers based on avp recommendations, though pilot oversight is necessary.
24. rerouting_instructions	plausible	communication systems are generally reliable, though occasional delays or errors can occur.
25. pilot_stress	not plausible	high-stress situations can impact a pilot's decision-making and performance, leading to errors.
26. by-passing_aircraft_visibility	not plausible	environmental factors like weather, lighting, and sensor limitations can impact visibility.
27. unpredictable_by-passing_aircraft_behaviour	not plausible	predicting erratic behavior is inherently challenging and can be affected by numerous unpredictable factors.
28. by-passing_aircraft_dynamics	not plausible	environmental conditions and sensor limitations can impact continuous and accurate tracking.

29. weather_data	not plausible	weather data can be affected by unpredictable changes and limitations in real-time data acquisition.
30. pilot_alerting_and_warning_systems	plausible	modern systems are designed to be reliable, though technical failures and malfunctions can occur.
31. collision_threat_alert	not plausible	system limitations, data processing delays, and unforeseen scenarios can affect the accuracy and timeliness of alerts.
32. weather_conditions	not plausible	weather conditions can change unpredictably and may not always be accurately reported in real-time.
33. surrounding_airspace_obstructions	not plausible	sensor limitations and environmental factors can impact the detection of obstructions.
34. own_aircraft_flight_path_change	plausible	modern flight management systems can handle flight path adjustments accurately, though pilot input is also crucial.
35. non_deterministic_intelligent_algorithms	not plausible	non-deterministic algorithms can produce variable outputs, which may not always be reliable.
36. by-passing_aircraft_direction	not plausible	environmental conditions and sensor limitations can affect the accuracy of tracking the direction of by-passing aircraft.
37. by-passing_aircraft_altitude	not plausible	sensor limitations and environmental factors can affect the accuracy of altitude measurements.
38. threat_predictive_model	not plausible	predictive models can be limited by the quality and completeness of the

		data they are based on, leading to inaccuracies.
39. risk_of_potential_collision	not plausible	assessing collision risk involves complex calculations that can be affected by various uncertainties and limitations in data.
40. cockpit_display_systems	plausible	modern cockpit display systems are designed to be reliable, though technical failures can still occur.
41. aircrafts_existing_warning_systems	plausible	modern warning systems are designed to be reliable, though technical failures can occur.
42. own_aircraft_yaw_change	plausible	modern aircraft control systems can execute yaw changes accurately based on avp recommendations, though pilot input is also crucial.
43. own_aircraft_altitude	plausible	modern flight management systems can manage altitude accurately, though sensor and system limitations can occur.
44. own_aircraft_radar	not plausible	environmental conditions and technical limitations can affect radar accuracy.
45. own_aircraft_lidar	not plausible	lidar performance can be affected by weather conditions and technical limitations.
46. environmental_obstructions	not plausible	sensor limitations and environmental factors can impact the detection of obstructions.
47. fog	not plausible	fog can significantly reduce visibility and impact the performance of visual and other sensors.

48. raindrops	not plausible	raindrops can significantly interfere with visual and lidar sensor performance.
49. cloud_cover	not plausible	cloud cover can impact the performance of visual sensors and lidar, reducing the effectiveness of threat detection.
50. cloud_type	not plausible	identifying and accounting for various cloud types can be complex and may not always be accurate.
51. cloud_turbulance	not plausible	turbulence can be unpredictable and difficult to measure accurately, impacting sensor performance and flight stability.
52. landscape_background	not plausible	sensor systems can be confused by complex backgrounds, leading to inaccuracies in detecting concerning objects.
53. daytime	plausible	modern sensor systems can adapt to varying lighting conditions, though extreme changes can still pose challenges.
54. sunlight	not plausible	sunlight can create significant glare and shadows, impacting sensor performance and visibility.
55. sun_position	not plausible	the sun’s position can create significant challenges for sensor accuracy and pilot visibility, particularly during sunrise and sunset.
56. own_camera	not plausible	environmental factors such as weather, lighting, and obstructions

		can affect the performance and clarity of camera sensors.
57. by-passing_aircraft_flight_path	not plausible	predicting the flight path of by-passing aircraft can be challenging due to erratic movements and sensor limitations.
58. collision_time	not plausible	calculating collision time involves complex variables and can be affected by inaccuracies in sensor data and unpredictable movements.
59. own_aircraft_response_time	plausible	modern aircraft systems are designed for quick response times, though factors such as system lag or pilot reaction time can vary.
60. own_aircraft_pilot_feedback	not plausible	pilots may experience delays or inaccuracies in providing feedback due to high workload or stress, affecting system performance.
61. avp_real_time_training	not plausible	real-time updates can be challenging due to the complexity of algorithms and potential delays in processing and feedback.
62. emergency_directives	plausible	modern systems are designed to handle emergency situations efficiently, though technical or communication issues can arise.
63. unsafe_proximity	not plausible	sensor limitations and environmental factors can impact the accuracy of proximity detection.
64. airspace_conflicts	not plausible	predicting and managing airspace conflicts involves complex calculations and can be affected by

		unpredictable factors and sensor limitations.
65. radar_and_visual_range	plausible	modern radar and visual systems are generally reliable, though environmental factors and technical limitations can impact performance.
66. airspace_visibility	not plausible	visibility can be affected by weather conditions, lighting, and obstructions, impacting the performance of visual sensors.
67. wind	not plausible	wind conditions can change unpredictably and can significantly impact flight stability and sensor performance.
68. cloud_turbulence	not plausible	turbulence can be unpredictable and difficult to measure accurately, impacting sensor performance and flight stability.
69. avp_confidence_threshold	plausible	avp systems are designed to operate within certain confidence levels, though external factors can affect performance.
70. by-passing_aircraft_hack_avp_threashold	not plausible	cybersecurity threats are a significant concern, and systems can be vulnerable to sophisticated hacking attempts.
71. own_aircraft_proximity	plausible	modern sensors can accurately measure proximity, though environmental factors can sometimes cause inaccuracies.
72. autonomous_collision_avoidance_maneuvers	plausible	autonomous systems are designed for such tasks, though they rely on

		accurate sensor data and may face unexpected situations.
73. potential_collision_threat_alert	not plausible	sensor limitations, data processing delays, and unforeseen scenarios can affect the accuracy and timeliness of alerts.
74. collision_avoidance	plausible	modern systems are capable of executing complex avoidance maneuvers, though unexpected factors can still pose challenges.
75. automated_own_aircraft_flight_path_change	plausible	modern flight management systems are designed to handle such tasks, though they depend on accurate data and real-time processing.
76. own_aircraft_altitude_change	plausible	modern flight management systems can manage altitude accurately, though sensor and system limitations can occur.
77. disturbed_own_aircraft_dynamics	plausible	modern systems are designed to handle dynamic changes, though extreme or unexpected conditions can pose challenges.
78. own_aircraft_speed_change	plausible	modern flight management systems can manage speed accurately, though sensor and system limitations can occur.
79. accelerated_own_aircraft_dynamics	plausible	modern systems are designed to monitor and manage acceleration dynamics accurately, though they can be affected by external factors.
80. own_aircraft_yaw_change	plausible	modern aircraft control systems can execute yaw changes accurately

		based on avp recommendations, though pilot input is also crucial.
81. accelerated_own_aircraft_roll	plausible	modern systems are designed to handle dynamic changes accurately, though extreme conditions can pose challenges.
82. accelerated_own_aircraft_pitch	plausible	modern systems can manage pitch dynamics accurately, though they can be affected by external factors.
83. accelerated_own_aircraft_yaw	plausible	modern systems can handle yaw changes accurately, though external factors can affect performance.
84. own_aircraft_flight_management_system_override	plausible	modern systems provide manual override capabilities, though pilot training and system design are crucial.
85. manual_own_aircraft_flight_path_change	plausible	modern systems can accommodate manual changes, though coordination between pilot and system is necessary.
86. weather_conditions_change	not plausible	weather conditions can change unpredictably and can significantly impact sensor performance and flight stability.
87. weather_data_change	plausible	modern systems are designed to process weather data accurately, though data reliability can vary.
88. own_aircraft_dynamics_change	plausible	modern systems are designed to handle dynamic changes, though extreme or unexpected conditions can pose challenges.

89. unpredictable_other_aircrafts_decision	not plausible	predicting the behavior of other aircraft can be challenging due to the variability and unpredictability of human actions.
90. automated_collision_avoidance_maneuvers	plausible	autonomous systems are designed for such tasks, though they rely on accurate sensor data and may face unexpected situations.
91. avp_detection_communication_delay_hack	not plausible	cybersecurity threats are a significant concern, and systems can be vulnerable to sophisticated hacking attempts.
92. pilot_cognitive_limit	plausible	modern systems are designed to support pilot decision-making, though stress can still significantly impact cognitive abilities.
93. surrounding_airspace_restrictions	plausible	modern flight management systems can account for airspace restrictions, though dynamic changes can pose challenges.
94. military_aircraft_intrusion	not plausible	military aircraft can operate unpredictably and may not always be detectable by civilian systems.
95. other_aircrafts_presence	plausible	modern systems are designed to track other aircraft, though sensor limitations and environmental factors can affect accuracy.
96. birds	not plausible	bird detection is challenging due to their small size and unpredictable movements, impacting sensor effectiveness.
97. drone_presence	not plausible	drones can be difficult to detect due to their small size and low altitude

		operations, impacting sensor effectiveness.
98. wind_shear_effect_on_camera	not plausible	wind shear can cause sudden and significant changes in flight dynamics, impacting the stability and performance of onboard cameras.
99. air_density_change_due_to_high_speed_effect_on_camera	not plausible	high-speed flight can cause significant changes in air density, impacting the performance and accuracy of onboard cameras.
100. aircraft_attitude_control	plausible	modern systems are designed to manage aircraft attitude accurately, though extreme conditions can still pose challenges.
101. mechanical_wear_and_tear	plausible	regular maintenance and inspections are designed to detect wear and tear, but some issues may still go unnoticed.
102. autopilot_system_failure	plausible	modern systems are designed with redundancy to handle autopilot failures, though unexpected issues can still arise.
103. information_overload_for_pilot	plausible	systems are designed to manage information flow, but high-stress situations can still overwhelm the pilot.
104. highly_stressfull_event	plausible	systems are designed to assist pilots, but extreme stress can still significantly impact their performance.
predicted factor	**concerning?**	**why should we be concerned or not?**

1. own_aircraft_pilot_decision_making_process	concerning	directly impacting flight safety, as over-reliance on the system could reduce the pilot's vigilance and situational awareness.
2. by-passing_aircraft_position	concerning	crucial for collision avoidance; inaccurate detection could lead to failure in preventing collisions.
3. stabilised_own_aircraft_dynamics	concerning	stability is essential for accurate sensor data and effective collision avoidance manoeuvres.
4. active_avp {avdds perception}	concerning	critical for pilot’s decision-making and ensuring timely response to potential threats.
5. own_aircraft_pilot_situation_awareness	concerning	high situational awareness is vital for effective decision-making and safe flight operations.
6. surrounding_airspace_safety	concerning	essential for collision avoidance and situational awareness, impacting decision-making and safety maneuvers.
7. avoidance_strategy_recommendation	concerning	critical for pilot’s decision-making and immediate response to collision threats, directly impacting flight safety.
8. visual_information	concerning	vital for accurate detection and assessment of potential threats, contributing to the overall situational awareness.
9. own_aircraft_flight_path	concerning	crucial for maintaining safe separation from other aircraft and ensuring efficient navigation and collision avoidance.

10. by-passing_aircraft_speed	concerning	accurate speed measurement is essential for predicting collision threats and recommending avoidance maneuvers.
11. collision_avoidance_system	concerning	critical for ensuring flight safety and preventing mid-air collisions by providing timely alerts and recommendations to pilots.
12. collision_threat	concerning	essential for the safety of the aircraft, as addressing collision threats is a primary objective of the avp system.
13. by-passing_aircraft_proximity	concerning	maintaining safe proximity is crucial for collision avoidance and ensuring safe flight operations.
14. atc {air traffic control}	concerning	integral to flight safety, ensuring proper aircraft separation and managing air traffic efficiently.
15. own_aircraft_flight_management_system	concerning	critical for maintaining the planned flight path, optimizing performance, and ensuring safety.
16. other_aircrafts	concerning	necessary for maintaining situational awareness and preventing collisions, especially in congested airspace.
17. by-passing_aircraft_detection_tracking	concerning	essential for timely detection and response to potential collision threats, ensuring safe flight operations.
18. by-passing_aircraft_motion_pattern	concerning	important for anticipating potential collision threats and recommending appropriate avoidance strategies.
19. own_aircraft_camera	concerning	crucial for the avp system to detect and assess potential threats

		accurately, contributing to situational awareness.
20. own_aircraft_roll_change	concerning	essential for executing effective avoidance maneuvers and maintaining safe flight operations.
21. own_aircraft_pitch_change	concerning	essential for executing effective avoidance maneuvers and maintaining safe flight operations.
22. own_aircraft_speed	concerning	crucial for maintaining safe separation from other aircraft and ensuring efficient navigation and collision avoidance.
23. own_aircraft_flight_maneuvers	concerning	critical for avoiding potential collisions and maintaining safe flight operations.
24. rerouting_instructions	concerning	integral for maintaining safe and efficient airspace management, preventing collisions.
25. pilot_stress	concerning	stress management is crucial for ensuring effective decision-making and safe flight operations.
26. by-passing_aircraft_visibility	concerning	vital for timely detection and assessment of potential threats, contributing to situational awareness.
27. unpredictable_by-passing_aircraft_behaviour	concerning	important for anticipating potential collision threats and recommending appropriate avoidance strategies.
28. by-passing_aircraft_dynamics	concerning	essential for timely detection and response to potential collision threats, ensuring safe flight operations.

29. weather_data	concerning	crucial for flight planning, situational awareness, and decision-making to avoid weather-related hazards.
30. pilot_alerting_and_warning_systems	concerning	essential for ensuring the pilot is aware of and can respond to potential threats promptly.
31. collision_threat_alert	concerning	crucial for timely pilot response to avoid collisions and ensure flight safety.
32. weather_conditions	concerning	important for flight planning and execution, impacting safety and navigation.
33. surrounding_airspace_obstructions	concerning	essential for maintaining situational awareness and avoiding collisions with obstacles.
34. own_aircraft_flight_path_change	concerning	crucial for avoiding potential conflicts and maintaining safe flight operations.
35. non_deterministic_intelligent_algorithms	concerning	important for decision-making processes and ensuring the accuracy of the avp system's recommendations.
36. by-passing_aircraft_direction	concerning	essential for predicting collision threats and recommending appropriate avoidance maneuvers.
37. by-passing_aircraft_altitude	concerning	important for maintaining safe separation vertically and avoiding collision threats.
38. threat_predictive_model	concerning	critical for anticipating collision threats and recommending timely avoidance strategies.

39. risk_of_potential_collision	concerning	crucial for informing the pilot and avp system's decision-making processes to prevent collisions.
40. cockpit_display_systems	concerning	essential for maintaining situational awareness and ensuring the pilot has access to all necessary information for safe flight operations.
41. aircrafts_existing_warning_systems	concerning	essential for ensuring the pilot is aware of and can respond to potential threats promptly.
42. own_aircraft_yaw_change	concerning	essential for executing effective avoidance maneuvers and maintaining safe flight operations.
43. own_aircraft_altitude	concerning	crucial for maintaining safe separation from other aircraft and ensuring efficient navigation and collision avoidance.
44. own_aircraft_radar	concerning	essential for maintaining situational awareness and avoiding collisions with other aircraft and objects.
45. own_aircraft_lidar	concerning	crucial for accurate situational awareness and preventing collisions by detecting objects accurately.
46. environmental_obstructions	concerning	essential for maintaining situational awareness and avoiding collisions with obstacles.
47. fog	concerning	important for maintaining situational awareness and detecting potential threats accurately.
48. raindrops	concerning	crucial for accurate sensor data and maintaining situational awareness in adverse weather conditions.

49. cloud_cover	concerning	important for maintaining situational awareness and detecting potential threats accurately.
50. cloud_type	concerning	crucial for understanding flight conditions and maintaining situational awareness.
51. cloud_turbulance	concerning	essential for maintaining flight stability and ensuring safe navigation through turbulent conditions.
52. landscape_background	concerning	crucial for accurate object detection and maintaining situational awareness in varying terrains.
53. daytime	concerning	important for ensuring continuous and reliable sensor performance regardless of the time of day.
54. sunlight	concerning	crucial for maintaining accurate sensor readings and situational awareness in varying sunlight conditions.
55. sun_position	concerning	important for ensuring continuous and reliable sensor performance and pilot visibility throughout the flight.
56. own_camera	concerning	essential for detecting and identifying potential threats accurately, contributing to overall situational awareness.
57. by-passing_aircraft_flight_path	concerning	crucial for anticipating collision threats and recommending appropriate avoidance strategies.
58. collision_time	concerning	essential for timely pilot response to avoid collisions and ensure flight safety.

59. own_aircraft_response_time	concerning	crucial for executing timely avoidance maneuvers and maintaining safe flight operations.
60. own_aircraft_pilot_feedback	concerning	important for continuously improving the avp system’s effectiveness and ensuring timely and accurate responses to potential threats.
61. avp_real_time_training	concerning	crucial for maintaining and improving the avp system's effectiveness and accuracy in threat detection and avoidance.
62. emergency_directives	concerning	essential for ensuring timely and effective responses to prevent collisions and ensure safety.
63. unsafe_proximity	concerning	crucial for preventing mid-air collisions and ensuring safe separation between aircraft.
64. airspace_conflicts	concerning	important for maintaining safe navigation and preventing mid-air collisions.
65. radar_and_visual_range	concerning	essential for maintaining situational awareness and detecting potential threats accurately.
66. airspace_visibility	concerning	essential for accurate detection and assessment of potential threats, contributing to overall situational awareness.
67. wind	concerning	important for maintaining flight stability and ensuring accurate sensor readings and effective navigation.
68. cloud_turbulence	concerning	essential for maintaining flight stability and ensuring safe navigation through turbulent conditions.

69. avp_confidence_threshold	concerning	crucial for maintaining the reliability and effectiveness of the avp system in detecting and responding to threats.
70. by-passing_aircraft_hack_avp_threashold	concerning	ensuring the security and integrity of the avp system is crucial for reliable operation and flight safety.
71. own_aircraft_proximity	concerning	essential for maintaining safe separation from other aircraft and preventing collisions.
72. autonomous_collision_avoidance_maneuvers	concerning	crucial for timely and effective collision avoidance, especially when pilot response time is limited.
73. potential_collision_threat_alert	concerning	crucial for timely pilot response to avoid collisions and ensure flight safety.
74. collision_avoidance	concerning	essential for ensuring flight safety and preventing mid-air collisions.
75. automated_own_aircraft_flight_path_change	concerning	crucial for avoiding potential conflicts and maintaining safe flight operations.
76. own_aircraft_altitude_change	concerning	crucial for maintaining safe separation from other aircraft and ensuring efficient navigation and collision avoidance.
77. disturbed_own_aircraft_dynamics	concerning	essential for maintaining flight stability and control under varying conditions.
78. own_aircraft_speed_change	concerning	crucial for maintaining safe separation from other aircraft and ensuring efficient navigation and collision avoidance.

79. accelerated_own_aircraft_dynamics	concerning	important for maintaining flight stability and ensuring safe and efficient operation during changes in speed.
80. own_aircraft_yaw_change	concerning	essential for executing effective avoidance maneuvers and maintaining safe flight operations.
81. accelerated_own_aircraft_roll	concerning	important for maintaining flight stability and ensuring safe and efficient operation during changes in speed.
82. accelerated_own_aircraft_pitch	concerning	essential for maintaining flight stability and ensuring safe and efficient operation during changes in speed.
83. accelerated_own_aircraft_yaw	concerning	crucial for maintaining flight stability and executing effective maneuvers during acceleration.
84. own_aircraft_flight_management_system_override	concerning	essential for allowing pilot intervention in critical situations, ensuring safety and control.
85. manual_own_aircraft_flight_path_change	concerning	important for maintaining flexibility and ensuring safe navigation based on pilot's judgment.
86. weather_conditions_change	concerning	essential for maintaining accurate sensor readings and safe navigation under varying weather conditions.
87. weather_data_change	concerning	crucial for flight planning and decision-making, impacting safety and navigation.
88. own_aircraft_dynamics_change	concerning	essential for maintaining flight stability and control under varying conditions.

89. unpredictable_other_aircrafts_decision	concerning	important for maintaining situational awareness and ensuring safe navigation amidst other aircraft.
90. automated_collision_avoidance_maneuvers	concerning	crucial for timely and effective collision avoidance, especially when pilot response time is limited.
91. avp_detection_communication_delay_hack	concerning	ensuring the security and integrity of the avp system is crucial for reliable operation and flight safety.
92. pilot_cognitive_limit	concerning	important for ensuring that the pilot can make informed decisions quickly and accurately, even under high stress.
93. surrounding_airspace_restrictions	concerning	crucial for ensuring compliance with airspace regulations and maintaining safe flight paths.
94. military_aircraft_intrusion	concerning	important for maintaining situational awareness and avoiding conflicts with military operations.
95. other_aircrafts_presence	concerning	crucial for maintaining situational awareness and preventing mid-air collisions.
96. birds	concerning	important for maintaining situational awareness and preventing bird strikes, especially during critical flight phases.
97. drone_presence	concerning	crucial for maintaining situational awareness and preventing collisions with drones.
98. wind_shear_effect_on_camera	concerning	important for ensuring accurate visual information and maintaining situational awareness during changing wind conditions.

99. air_density_change_due_to_high_speed_effect_on_camera	concerning	crucial for maintaining accurate visual information and situational awareness during high-speed flight.
100. aircraft_attitude_control	concerning	essential for maintaining flight stability and control, ensuring safe and efficient operation.
101. mechanical_wear_and_tear	concerning	crucial for ensuring the long-term reliability and safety of the aircraft.
102. autopilot_system_failure	concerning	important for maintaining control of the aircraft and ensuring safe operation even in the event of a system failure.
103. information_overload_for_pilot	concerning	crucial for ensuring the pilot can make effective decisions without being overwhelmed by excessive information.
104. highly_stressfull_event	concerning	important for ensuring the pilot can maintain performance and make effective decisions under high-stress conditions.
predicted factor	**hazard?**	**How and why is it hazardous?**
1. own_aircraft_pilot_decision_making_process	yes	Over-reliance on the system can reduce pilot vigilance, potentially leading to slower reactions in unexpected situations.
2. by-passing_aircraft_position	yes	inaccurate detection can result in the failure to avoid collisions, directly risking flight safety.
3. stabilised_own_aircraft_dynamics	yes	unstable dynamics can lead to inaccurate sensor data and

		ineffective collision avoidance maneuvers, compromising safety.
4. active_avp {avdds perception}	yes	delays or inaccuracies in alerts can lead to missed or incorrect responses to threats, jeopardizing flight safety.
5. own_aircraft_pilot_situation_awareness	yes	degraded situational awareness can lead to poor decision-making and slow responses to emerging threats, increasing the risk of incidents.
6. surrounding_airspace_safety	yes	inaccurate or delayed information can lead to missed collision threats.
7. avoidance_strategy_recommendation	yes	incorrect recommendations can lead to inappropriate maneuvers, increasing collision risk.
8. visual_information	yes	poor visual information can lead to missed or incorrect identification of threats.
9. own_aircraft_flight_path	yes	deviation from the flight path can lead to unexpected conflicts with other aircraft.
10. by-passing_aircraft_speed	yes	incorrect speed measurement can lead to incorrect threat predictions.
11. collision_avoidance_system	yes	failure to detect threats can lead to collisions.
12. collision_threat	yes	missed threats can result in collisions.
13. by-passing_aircraft_proximity	yes	inaccurate proximity measurements can lead to unsafe distances between aircraft.
14. atc {air traffic control}	yes	delays or inaccuracies in atc instructions can lead to conflicts and collisions.

15. own_aircraft_flight_management_system	yes	system failures can lead to deviations from planned parameters, increasing collision risk.
16. other_aircrafts	yes	failure to detect other aircraft can lead to missed collision threats.
17. by-passing_aircraft_detection_tracking	yes	failure to track by-passing aircraft can lead to missed collision threats.
18. by-passing_aircraft_motion_pattern	yes	incorrect predictions can lead to inadequate avoidance strategies.
19. own_aircraft_camera	yes	poor visual information can lead to missed or incorrect identification of threats.
20. own_aircraft_roll_change	yes	incorrect roll changes can lead to ineffective maneuvers, increasing collision risk.
21. own_aircraft_pitch_change	yes	incorrect pitch changes can lead to ineffective maneuvers, increasing collision risk.
22. own_aircraft_speed	yes	inaccurate speed adjustments can lead to unsafe distances between aircraft.
23. own_aircraft_flight_maneuvers	yes	incorrect maneuvers can lead to ineffective collision avoidance.
24. rerouting_instructions	yes	miscommunication can lead to conflicts and increased collision risk.
25. pilot_stress	yes	high stress can lead to errors in judgment and delayed reactions, increasing collision risk.
26. by-passing_aircraft_visibility	yes	poor visibility can lead to missed or incorrect identification of threats.

27. unpredictable_by-passing_aircraft_behaviour	yes	incorrect predictions can lead to inadequate avoidance strategies, increasing collision risk.
28. by-passing_aircraft_dynamics	yes	failure to track by-passing aircraft accurately can lead to missed collision threats.
29. weather_data	yes	inaccurate weather data can lead to misinformed decisions and increased risk of weather-related incidents.
30. pilot_alerting_and_warning_systems	yes	failure of alerting systems can lead to missed threats and delayed responses, increasing collision risk.
31. collision_threat_alert	yes	delayed or inaccurate alerts can lead to missed threats and increased collision risk.
32. weather_conditions	yes	inaccurate weather data can lead to poor decision-making and increased risk of weather-related incidents.
33. surrounding_airspace_obstructions	yes	undetected obstructions can lead to collisions.
34. own_aircraft_flight_path_change	yes	incorrect or delayed path changes can lead to conflicts with other aircraft or obstacles.
35. non_deterministic_intelligent_algorithms	yes	unreliable algorithm outputs can lead to incorrect decisions and increased risk of collision.
36. by-passing_aircraft_direction	yes	incorrect tracking can lead to missed or incorrect threat predictions.
37. by-passing_aircraft_altitude	yes	incorrect altitude measurements can lead to unsafe distances between aircraft.

38. threat_predictive_model	yes	inaccurate threat predictions can lead to delayed or inappropriate responses, increasing collision risk.
39. risk_of_potential_collision	yes	underestimating collision risk can lead to inadequate preventative actions, increasing collision likelihood.
40. cockpit_display_systems	yes	display system failures can lead to a lack of critical information, impairing the pilot's ability to respond to threats.
41. aircrafts_existing_warning_systems	yes	failure of warning systems can lead to missed threats and delayed responses, increasing collision risk.
42. own_aircraft_yaw_change	yes	incorrect yaw changes can lead to ineffective maneuvers, increasing collision risk.
43. own_aircraft_altitude	yes	inaccurate altitude adjustments can lead to unsafe distances between aircraft.
44. own_aircraft_radar	yes	inaccurate or delayed radar data can lead to missed threats and increased collision risk.
45. own_aircraft_lidar	yes	inaccurate lidar data can lead to missed or incorrect identification of threats.
46. environmental_obstructions	yes	undetected obstructions can lead to collisions.
47. fog	yes	reduced visibility due to fog can lead to missed or incorrect identification of threats.

48. raindrops	yes	interference from raindrops can lead to missed or incorrect identification of threats.
49. cloud_cover	yes	reduced visibility due to cloud cover can lead to missed or incorrect identification of threats.
50. cloud_type	yes	incorrect identification of cloud types can lead to misjudgment of flight conditions and increased risk of incidents.
51. cloud_turbulance	yes	undetected or unaccounted turbulence can lead to sudden instability, impacting control and safety.
52. landscape_background	yes	misidentification due to background complexity can lead to missed or incorrect threat detection.
53. daytime	yes	poor adaptation to lighting changes can reduce visibility and sensor accuracy, increasing collision risk.
54. sunlight	yes	glare and shadows can lead to missed or incorrect identification of threats.
55. sun_position	yes	poor accounting for the sun's position can lead to missed or incorrect identification of threats, increasing collision risk.
56. own_camera	yes	poor visual information can lead to missed or incorrect identification of threats.
57. by-passing_aircraft_flight_path	yes	incorrect predictions can lead to inadequate avoidance strategies, increasing collision risk.

58. collision_time	yes	inaccurate collision time estimates can lead to delayed responses, increasing collision risk.
59. own_aircraft_response_time	yes	delayed response times can lead to inadequate avoidance maneuvers, increasing collision risk.
60. own_aircraft_pilot_feedback	yes	inaccurate or delayed feedback can reduce the effectiveness of the avp system, impacting flight safety.
61. avp_real_time_training	yes	delayed or incorrect updates can reduce system effectiveness, impacting flight safety.
62. emergency_directives	yes	delayed or unclear directives can lead to inadequate responses, increasing collision risk.
63. unsafe_proximity	yes	inaccurate detection can lead to missed threats and increased collision risk.
64. airspace_conflicts	yes	mismanagement of airspace conflicts can lead to increased collision risk.
65. radar_and_visual_range	yes	limitations in detection range can lead to missed threats and increased collision risk.
66. airspace_visibility	yes	poor visibility can lead to missed or incorrect identification of threats.
67. wind	yes	unaccounted wind effects can lead to instability and incorrect sensor data, increasing collision risk.
68. cloud_turbulence	yes	undetected or unaccounted turbulence can lead to sudden instability, impacting control and safety.

69. avp_confidence_threshold	yes	low confidence thresholds can lead to unreliable system operation and increased risk of missed threats.
70. by-passing_aircraft_hack_avp_threashold	yes	successful hacking attempts can lead to incorrect system operation and increased collision risk.
71. own_aircraft_proximity	yes	inaccurate proximity measurements can lead to unsafe distances and increased collision risk.
72. autonomous_collision_avoidance_maneuvers	yes	ineffective maneuvers can fail to avoid collisions, increasing risk.
73. potential_collision_threat_alert	yes	delayed or inaccurate alerts can lead to missed threats and increased collision risk.
74. collision_avoidance	yes	ineffective collision avoidance measures can lead to increased collision risk.
75. automated_own_aircraft_flight_path_change	yes	incorrect or delayed path changes can lead to conflicts with other aircraft or obstacles.
76. own_aircraft_altitude_change	yes	inaccurate altitude adjustments can lead to unsafe distances between aircraft.
77. disturbed_own_aircraft_dynamics	yes	unmanaged disturbances can lead to instability and increased collision risk.
78. own_aircraft_speed_change	yes	inaccurate speed adjustments can lead to unsafe distances between aircraft.
79. accelerated_own_aircraft_dynamics	yes	mismanaged acceleration dynamics can lead to instability and increased collision risk.

80. own_aircraft_yaw_change	yes	incorrect yaw changes can lead to ineffective maneuvers, increasing collision risk.
81. accelerated_own_aircraft_roll	yes	mismanaged roll during acceleration can lead to instability and increased collision risk.
82. accelerated_own_aircraft_pitch	yes	mismanaged pitch during acceleration can lead to instability and increased collision risk.
83. accelerated_own_aircraft_yaw	yes	mismanaged yaw during acceleration can lead to ineffective maneuvers, increasing collision risk.
84. own_aircraft_flight_management_system_override	yes	inability to override can lead to loss of control in emergencies.
85. manual_own_aircraft_flight_path_change	yes	poor integration of manual changes can lead to navigation errors and increased collision risk.
86. weather_conditions_change	yes	unaccounted weather changes can lead to poor sensor performance and increased risk of incidents.
87. weather_data_change	yes	inaccurate weather data can lead to poor decision-making and increased risk of weather-related incidents.
88. own_aircraft_dynamics_change	yes	unmanaged dynamic changes can lead to instability and increased collision risk.
89. unpredictable_other_aircrafts_decision	yes	unanticipated decisions by other aircraft can lead to conflicts and increased collision risk.
90. automated_collision_avoidance_maneuvers	yes	ineffective maneuvers can fail to avoid collisions, increasing risk.

91. avp_detection_communication_delay_hack	yes	successful hacking attempts can lead to delayed system responses and increased collision risk.
92. pilot_cognitive_limit	yes	cognitive overload can lead to delayed or incorrect decisions, increasing collision risk.
93. surrounding_airspace_restrictions	yes	failure to comply with airspace restrictions can lead to regulatory violations and increased collision risk.
94. military_aircraft_intrusion	yes	unanticipated military aircraft movements can lead to airspace conflicts and increased collision risk.
95. other_aircrafts_presence	yes	inaccurate tracking can lead to missed threats and increased collision risk.
96. birds	yes	undetected bird activity can lead to bird strikes and potential damage to the aircraft.
97. drone_presence	yes	undetected drone activity can lead to mid-air collisions and increased safety risks.
98. wind_shear_effect_on_camera	yes	wind shear can lead to unstable camera footage, reducing the effectiveness of visual sensors.
99. air_density_change_due_to_high_speed_effect_on_camera	yes	air density changes can lead to distorted camera footage, reducing the effectiveness of visual sensors.
100. aircraft_attitude_control	yes	mismanaged attitude control can lead to instability and increased collision risk.
101. mechanical_wear_and_tear	yes	undetected wear and tear can lead to component failures, increasing the risk of incidents.

102. autopilot_system_failure	yes	autopilot failure without effective backup can lead to loss of control and increased collision risk.
103. information_overload_for_pilot	yes	information overload can lead to delayed or incorrect decisions, increasing collision risk.
104. highly_stressfull_event	yes	high stress can lead to cognitive overload, impaired decision-making, and increased collision risk.