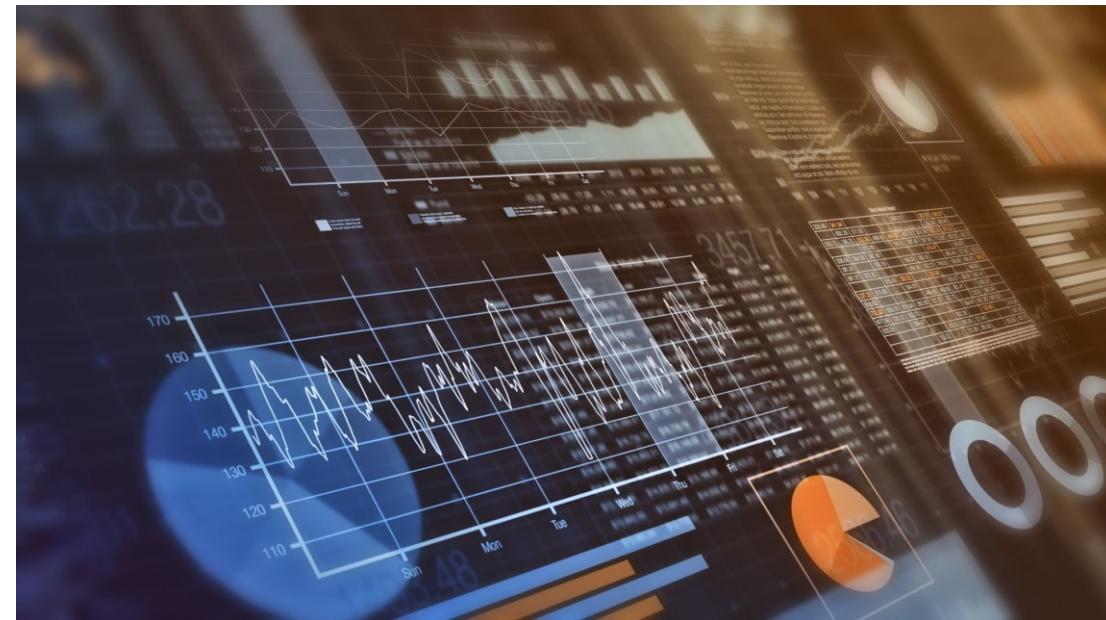


Safety Validation Report for AVOID Dataset using the CuneiForm method

Dataset Safety Report
By
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The output of AVOIDDS Case Study



Part of PhD project Supervised by
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Thales UK

Definitions

Concept	Definition
ALARP	As Low As Reasonably Practicable
ArcUC	Architect Epistemic Uncertainty Curve for a given dataset
PHI	Pictorial Visible Horizon Attitude Indicator
TOI	Target Object of Interest

Introduction

- **Objective:** Assess the **trustworthiness** of AVOIDDS for **AI-based mid-air collision avoidance systems**.
- **Validation Methodology:** Applied **CuneiForm analysis** to evaluate dataset completeness, bias, and epistemic uncertainty. Access the paper [here](#).
- **Key Dimensions Analyzed:**
 - **Time-of-day coverage** (bias in night/midday instances).
 - **Cloud coverage distribution** (imbalanced across scenarios).
 - **Pictorial distance & object positioning** (lack of dangerously close TOIs).
 - **Horizon attitude coverage** (limited diversity in aircraft perspectives).

Purpose of Report

The **purpose of this report** is to assess the AVOID dataset's **suitability for training AI-based mid-air collision avoidance perception models** by evaluating its **epistemic uncertainty and dataset bias** across CuneiForm epistemic training classes. Specifically, this report aims to:

- **Validate dataset completeness** using the **CuneiForm method**, ensuring that training samples cover diverse operational conditions.
- **Identify dataset biases** that may introduce epistemic uncertainty, leading to unreliable model performance in critical scenarios.
- **Evaluate dataset suitability** for **Black Swan** scenarios, determining whether the dataset supports robust AI decision-making in unpredictable or rare events.
- **Assess the trustworthiness** of AVOIDDS for **real-world safety-critical applications**, particularly for aviation-based detect-and-avoid systems.
- **Provide mitigation strategies** to improve dataset robustness, ensuring compliance with ALARP uncertainty coverage standards.

Findings

Dataset lacks coverage for **critical Black Swan scenarios**.

High uncertainty in detecting close, and atypically oriented aircraft.

Potential risks in real-world applications for mid-air collision avoidance.

Satisfying ALARP Requirements

AVOIDDS does not pass the ALARP criteria for the coverage of times of day training classes.

AVOIDDS does not satisfactorily fulfil the ALARP requirement for pictorial distance training classes coverage.

AVOIDDS does not satisfactorily fulfil the ALARP requirement for TOI's positioning training classes coverage.

AVOIDDS does not satisfactorily fulfil the ALARP requirement for pictorial horizon attitudes training classes coverage.

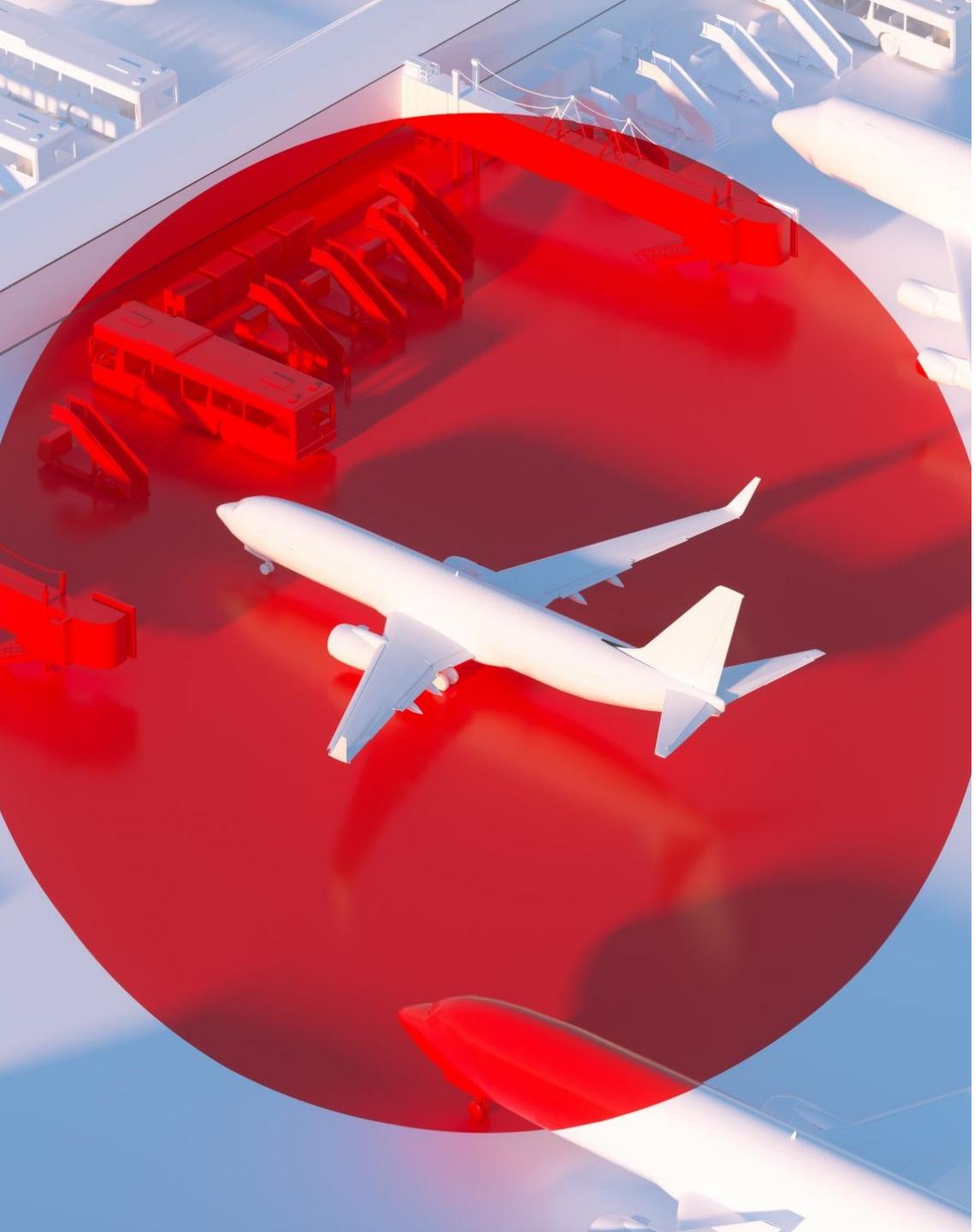
Recommendations

Improve	Expand	Enhance
Improve dataset balance across CuneiForm Training Classes.	Expand training instances to cover underrepresented Black Swan Scenarios.	Enhance epistemic coverage to meet ALARP (As Low As Reasonably Practicable) safety standards.

Conclusion

AVOIDDS is **useful as a benchmark** but requires **further improvements** to support real-world **safety-critical aviation AI models**.





AVOID Dataset description

This repository contains datasets, models, and simulators for the AVOIDDS (Aircraft Vision-based Intruder Detection Dataset and Simulator) benchmark, which centres around the vision-based aircraft detect-and-avoid (DAA) problem. The full AVOIDDS dataset, which includes 72,000 labelled images, is available here: purl.stanford.edu/hj293cv5980.



Assumptions

- The sample_small folder of training and validation datasets is statistically representative of AVOIDDS dataset.
 - 30 images, training sample.
 - 30 images validation sample.
- Time of day, Clouds types, file names all taken directly from the provided state_data.xlsx in the repository.
- The CuneiForm coverage results on the representative sample are accepted as a quality assessment of the entire AVOIDDS dataset.

Definition of ALARP

Our ODD classification for time of day

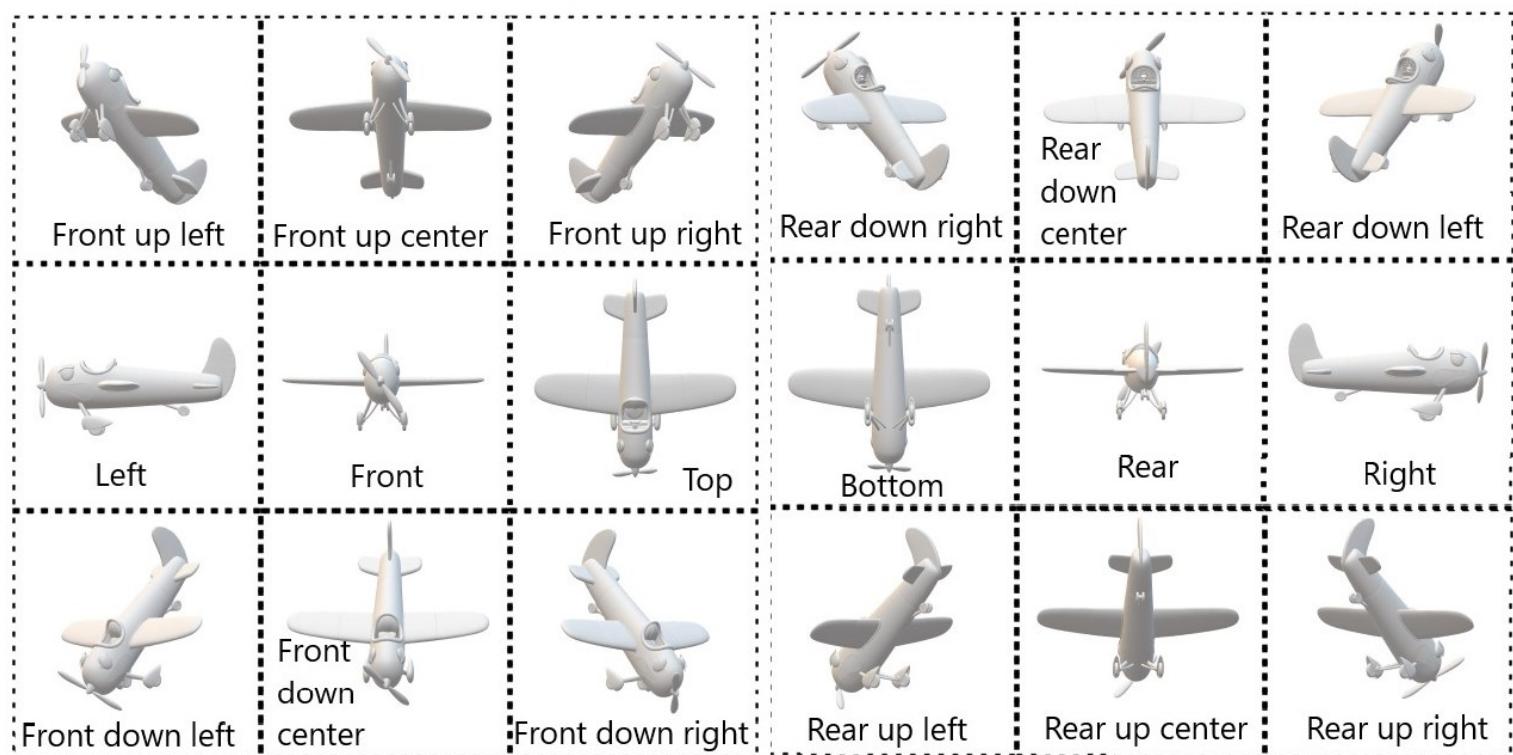
Category	Time Range
Early Morning (Dawn)	4:00 AM - 6:00 AM
Morning	6:00 AM - 9:00 AM
Mid-Morning	9:00 AM - 11:00 AM
Midday (Noon)	11:00 AM - 1:00 PM
Afternoon	1:00 PM - 4:00 PM
Evening	4:00 PM - 6:00 PM
Evening (Dusk)	6:00 PM - 8:00 PM
Night	8:00 PM - 4:00 AM

- To reduce the risk of perception failure due to insufficient development dataset coverage, statistically sound samples should demonstrate the following coverage criteria:
 - Note: the following criteria in the blue table are directly taken from AVOIDDS documentation associated with their datasets.
 - Their classification of timing did not make sense, so we used our time of day classification.

ODD Dimension	Training class spec
Weather Conditions	clear, high cirrus, scattered clouds, broken clouds, overcast, stratus
Time of Day	morning, midday, afternoon, and late afternoon.

TOI's 3D orientation coverage to achieve ALARP requirement

To reduce the risk of epistemic uncertainty that can lead to perception failure due to insufficient development dataset coverage, statistically sound samples should demonstrate the following training classes coverage criteria:



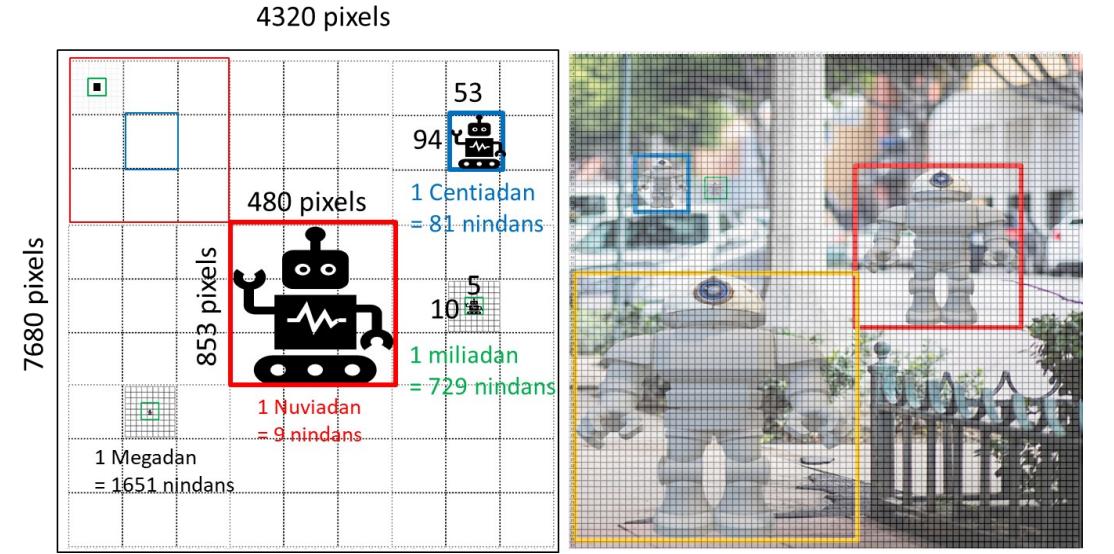
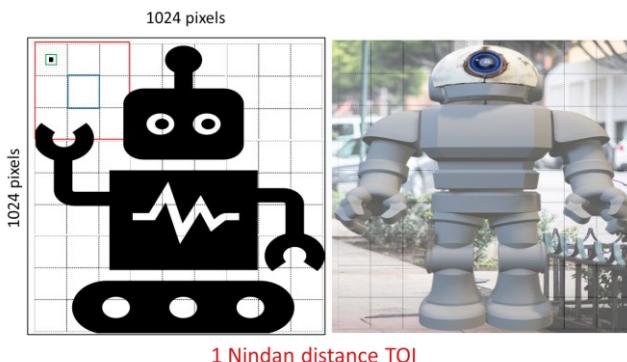
Pictorial distance categories to achieve ALARP requirements

To reduce the risk of perception failure due to insufficient development dataset coverage, statistically sound samples should demonstrate the following coverage criteria:

To define the pictorial distance units, we define the following system:

1 Nindan = the TOI pictorial size, covers the size of the picture frame.

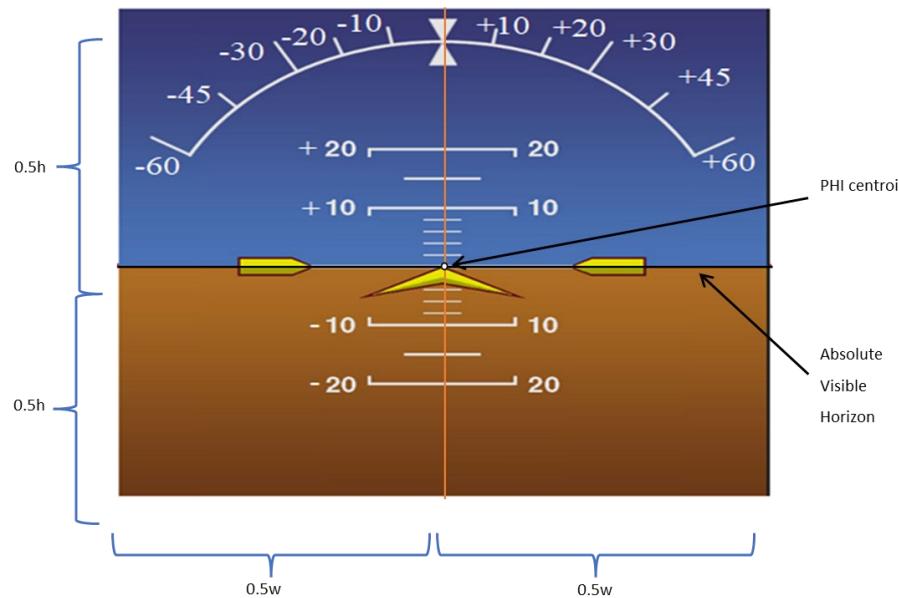
- 1 Nuviadan = 9 Nindans further away = 1/9 frame area
- 1 Centiadan = 81 Nindans further away = 1/81 frame area
- 1 Miliadan = $81 \times 9 = 729$ Nindans further away = 1/729 frame area



Category (wrt human verifier)	Pictorial Distance (Dx) Range	Example
Extremely Unrecognisable TOI Distance	$Dx > 1600$ nindans	
Moderately Recognisable TOI Distance	$729 > Dx \leq 1600$ nindans	
Recognisable TOI Distance	$300 > Dx \leq 729$ nindans	
Clear Close TOI Distance	$40 > Dx \leq 300$ nindans	
Dangerously Close TOI Distance	$Dx \leq 40$ nindans	

Horizon attitude categories to achieve ALARP requirements

To reduce the risk of perception failure due to insufficient development dataset coverage, statistically sound samples should demonstrate the following coverage criteria:

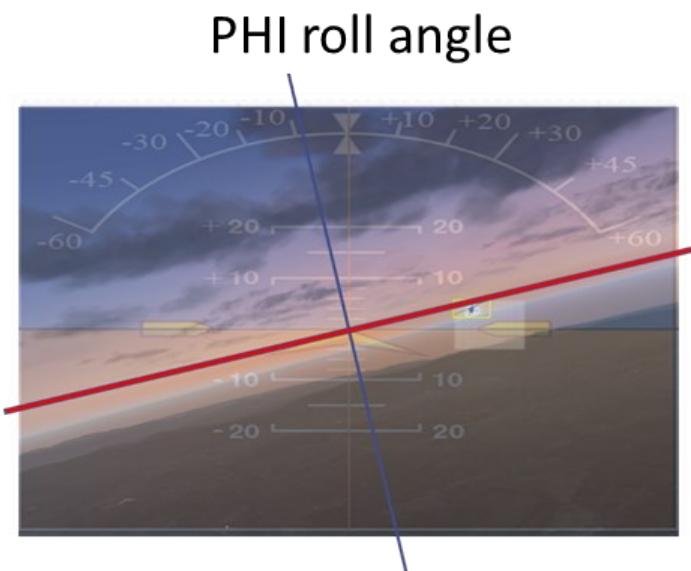
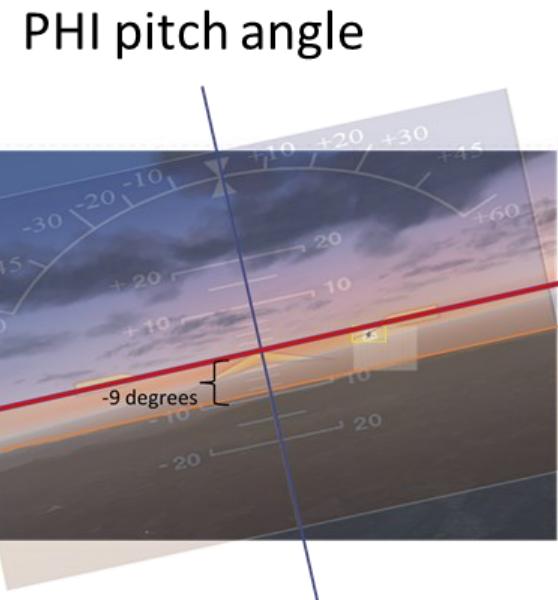
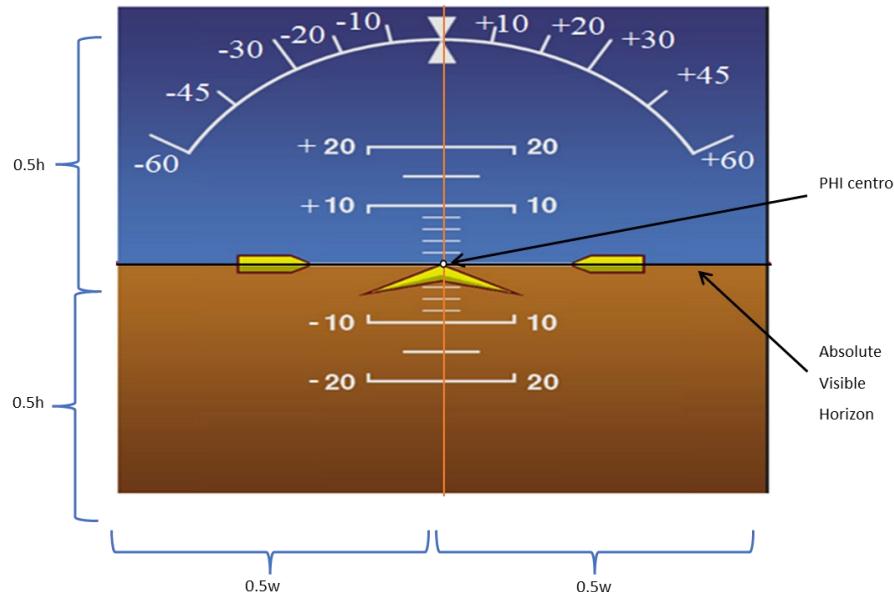


Horizon attitude category	Roll Range	Pitch Range
Level Horizon	$-1 \leq \text{ROLL} \leq 1$	$-1 \leq \text{PITCH} \leq 1$
Positively Tilted Level Horizon	$1 < \text{ROLL} \leq 90$	$-1 \leq \text{PITCH} \leq 1$
Negatively Tilted Level Horizon	$-90 \leq \text{ROLL} < -1$	$-1 \leq \text{PITCH} \leq 1$
Elevated Level Horizon	$-1 \leq \text{ROLL} \leq 1$	$1 < \text{PITCH} \leq 45$
Positively Tilted Elevated Horizon	$1 < \text{ROLL} \leq 90$	$1 < \text{PITCH} \leq 45$
Negatively Tilted Elevated Horizon	$-90 \leq \text{ROLL} < -1$	$1 < \text{PITCH} \leq 45$
Acute Angled Bird's Eye Ground View	$-90 \leq \text{ROLL} \leq 90$	$45 < \text{PITCH} \leq 80$
Bird's Eye Ground View	$-90 \leq \text{ROLL} \leq 90$	$80 < \text{PITCH} \leq 90$
Lowered Level Horizon	$-1 \leq \text{ROLL} \leq 1$	$-45 \leq \text{PITCH} < -1$
Positively Tilted Lowered Horizon	$1 < \text{ROLL} \leq 90$	$-45 \leq \text{PITCH} < -1$
Negatively Tilted Lowered Horizon	$-90 \leq \text{ROLL} < -1$	$-45 \leq \text{PITCH} < -1$
Acute Angled Rocket Sky View	$-90 \leq \text{ROLL} \leq 90$	$-80 \leq \text{PITCH} < -45$
Ascending Rocket Sky View	$-90 \leq \text{ROLL} \leq 90$	$-90 \leq \text{PITCH} < -80$

Horizon attitude categories to achieve ALARP requirements

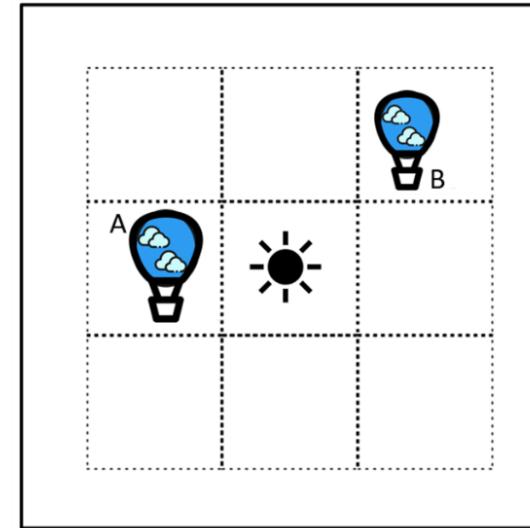
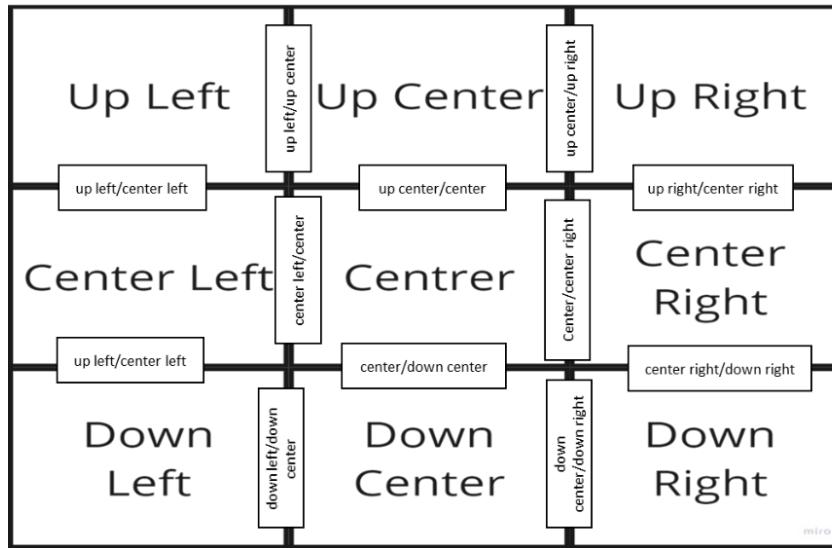
To reduce the risk of perception failure due to insufficient development dataset coverage, statistically sound samples should demonstrate the following coverage criteria:

Horizon attitude category	Roll Range	Pitch Range
Level Horizon	$-1 \leq \text{ROLL} \leq 1$	$-1 \leq \text{PITCH} \leq 1$
Positively Tilted Level Horizon	$1 < \text{ROLL} \leq 90$	$-1 \leq \text{PITCH} \leq 1$
Negatively Tilted Level Horizon	$-90 \leq \text{ROLL} < -1$	$-1 \leq \text{PITCH} \leq 1$
Elevated Level Horizon	$-1 \leq \text{ROLL} \leq 1$	$1 < \text{PITCH} \leq 45$
Positively Tilted Elevated Horizon	$1 < \text{ROLL} \leq 90$	$1 < \text{PITCH} \leq 45$
Negatively Tilted Elevated Horizon	$-90 \leq \text{ROLL} < -1$	$1 < \text{PITCH} \leq 45$
Acute Angled Bird's Eye Ground View	$-90 \leq \text{ROLL} \leq 90$	$45 < \text{PITCH} \leq 80$
Bird's Eye Ground View	$-90 \leq \text{ROLL} \leq 90$	$80 < \text{PITCH} \leq 90$
Lowered Level Horizon	$-1 \leq \text{ROLL} \leq 1$	$-45 \leq \text{PITCH} < -1$
Positively Tilted Lowered Horizon	$1 < \text{ROLL} \leq 90$	$-45 \leq \text{PITCH} < -1$
Negatively Tilted Lowered Horizon	$-90 \leq \text{ROLL} < -1$	$-45 \leq \text{PITCH} < -1$
Acute Angled Rocket Sky View	$-90 \leq \text{ROLL} \leq 90$	$-80 \leq \text{PITCH} \leq -45$
Ascending Rocket Sky View	$-90 \leq \text{ROLL} \leq 90$	$-90 \leq \text{PITCH} \leq -80$



To reduce the risk of perception failure due to insufficient development dataset coverage, statistically sound samples should demonstrate the following training class coverage criteria:

down right	center right	up right
down center	center	up center
down left	center left	up left
up left/center left	center left/center	center/down center
up left/center left	down left/down center	up center/up right
up left/up center	up center/center	Center/center right
down center/down right	up right/center right	center right/down right



TOI's positioning Training classes to achieve ALARP requirements

AVOIDDS Training Sample Validation Process



4.jpg



10.jpg



21.jpg



22.jpg



33.jpg



34.jpg

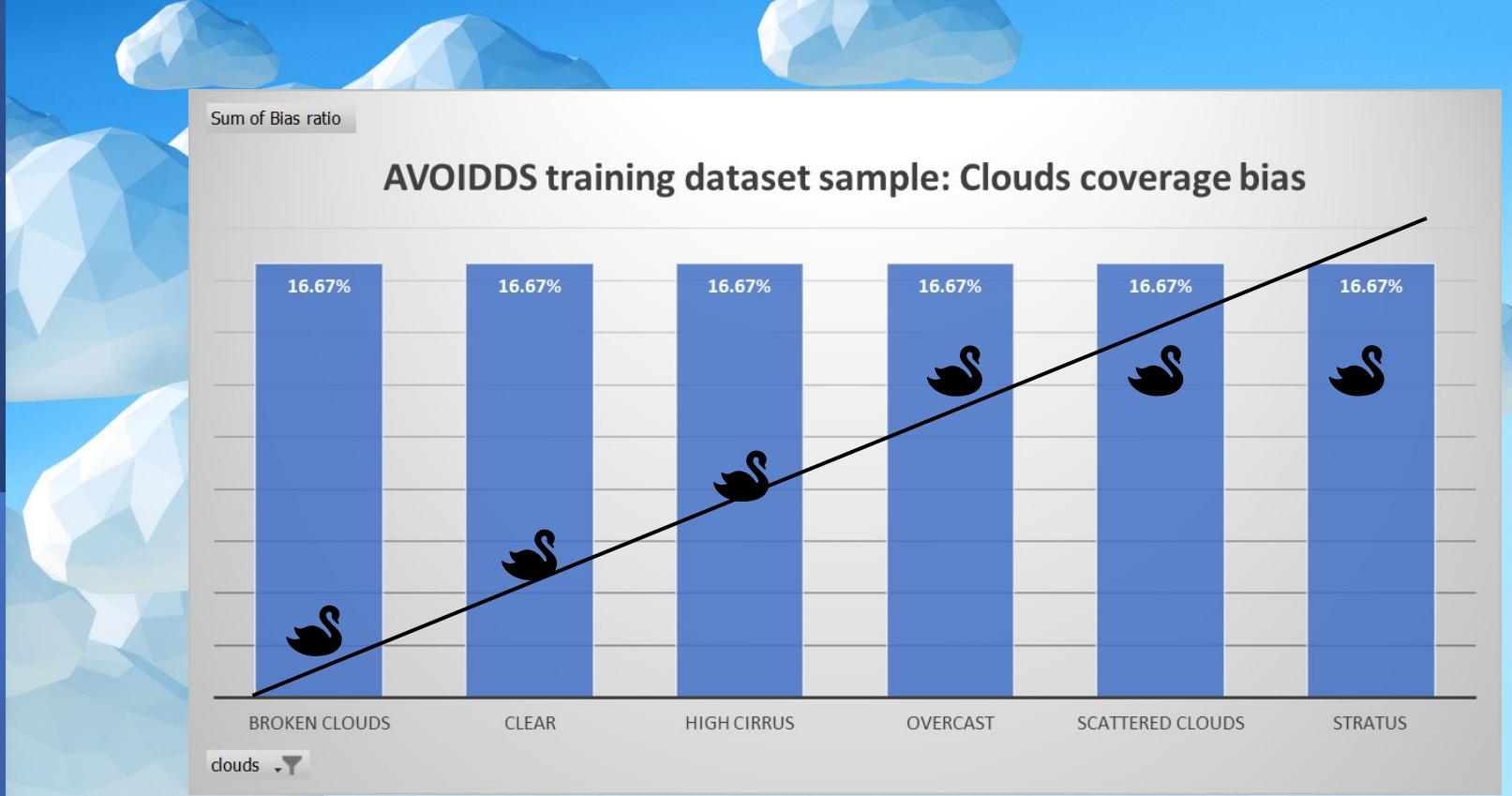


50.jpg



51.jpg

Examining AVOIDDS Training Strategy in Covering Clouds type:

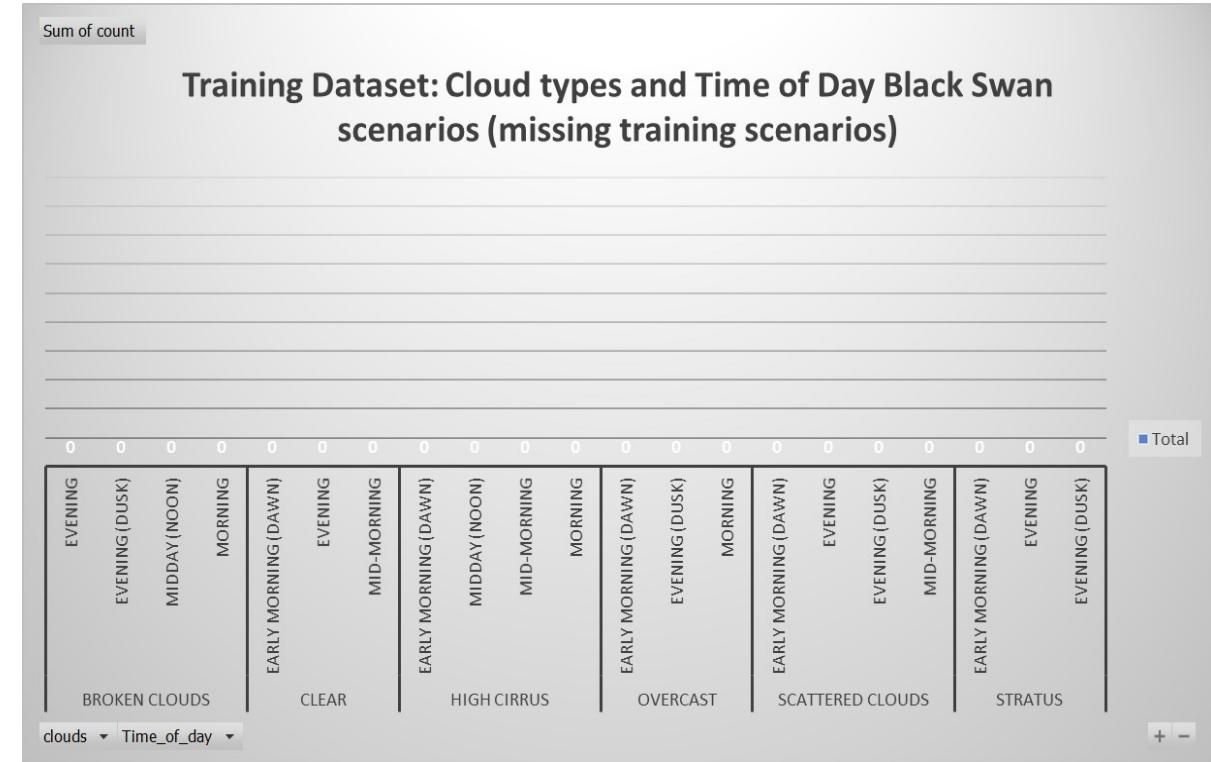
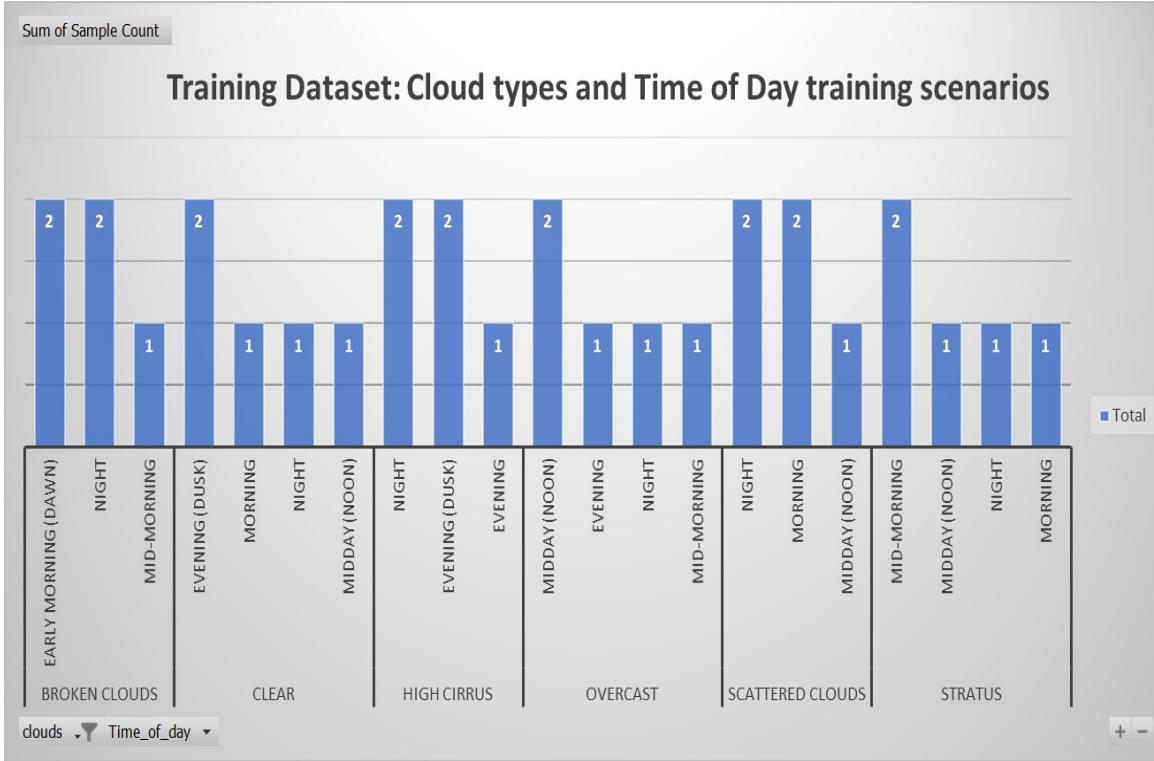


The cloud coverage appears to be balanced, suggesting that the perception system is exposed to equal experiences in each category of cloud type. The dataset satisfactorily meets the ALARP (As Low As Reasonably Practicable) requirement within cloud types coverage.

However, some instances in the training dataset do not represent the types of clouds specified; for example, high cirrus clouds need to be captured adequately, as the clouds in the sample images represent broken or scattered clouds. Furthermore, there is no evidence of bias in the analysis.

The balanced coverage suggests a uniform (equal) chance of handling emergent black swan events in each category. The datasets pass the ALARP requirement for dealing with black swan events.

Missing Training and Black Swan Scenarios

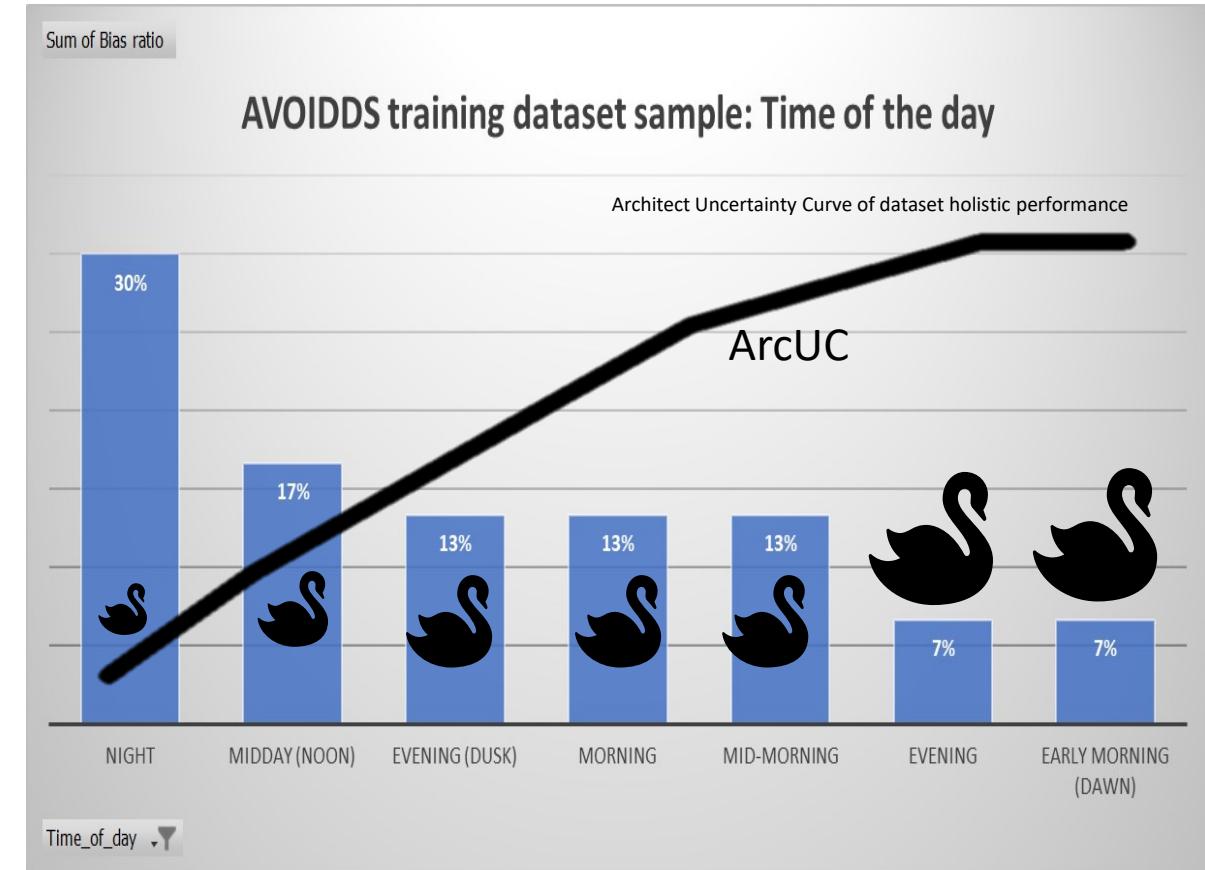


Examining AVOIDDS Training Strategy in Covering Time-of-Day Training Classes

There exists an imbalance in coverage, with 47% of instances recorded at night or at midday (noon) demonstrating strong bias.

The lack of balanced exposure constitutes a potential for an exponentially unpredictable high-risk emergent black swan behaviour performed by the perception. The dataset does not satisfactorily meet the ALARP requirement.

This dataset does not pass the ALARP criteria for the coverage of times of day categories. The unbalanced coverage leads to hazardous uncertainty in the intelligent system's behaviour during Black Swan scenarios in a respective category.



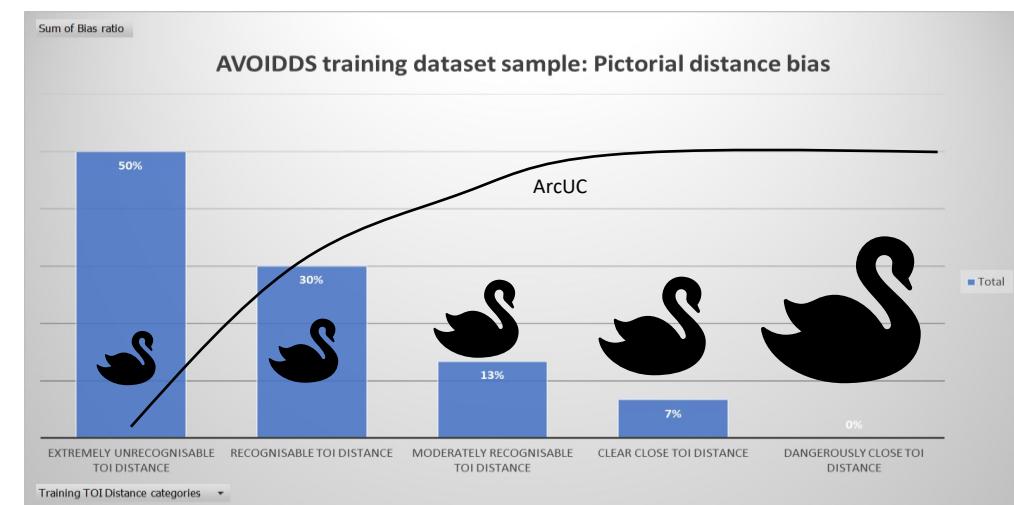
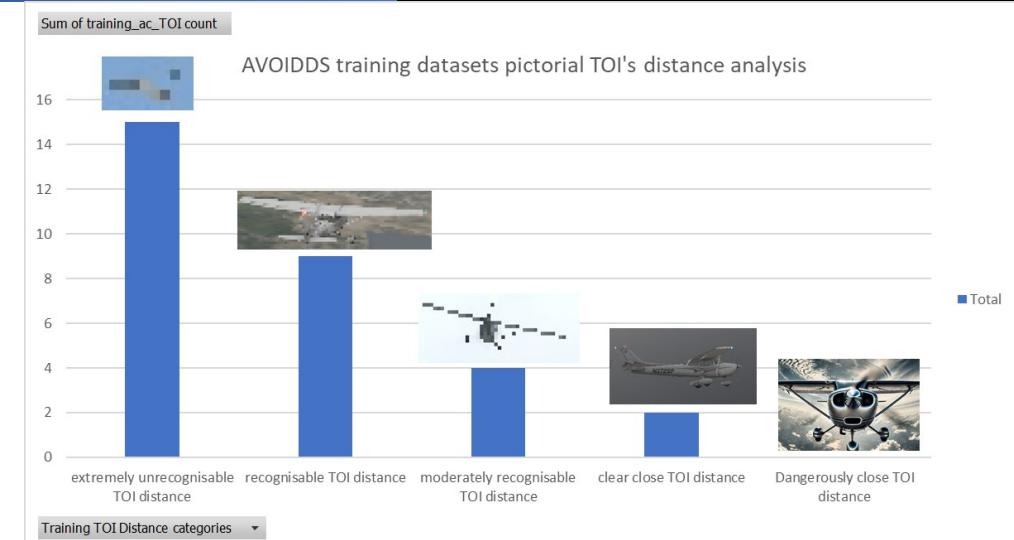
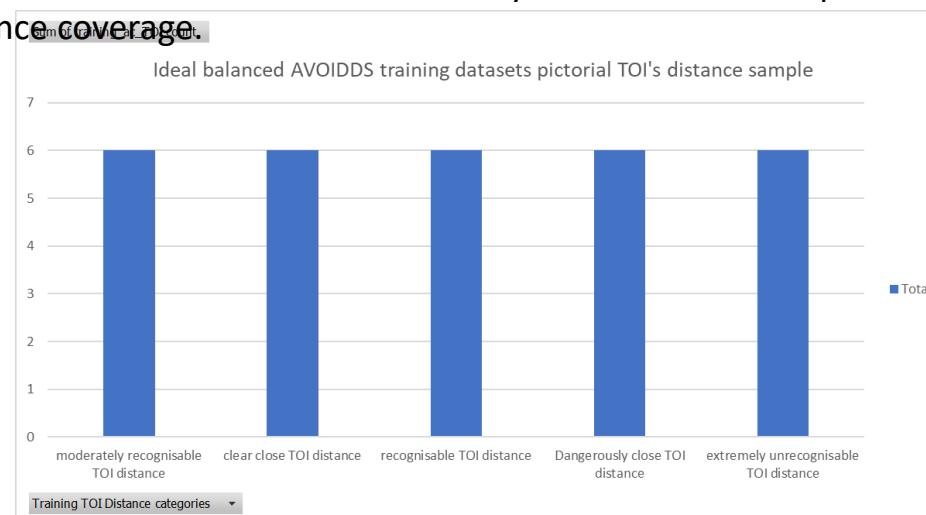
Examining AVOIDDS Training Strategy in Covering Pictorial Distance Training Classes:

The dataset exhibits significant imbalance, with 50% of instances in 20% of required coverage. Categorized as occurring at “extremely unrecognizable distance”. Notably, there is a complete absence of instances classified as :

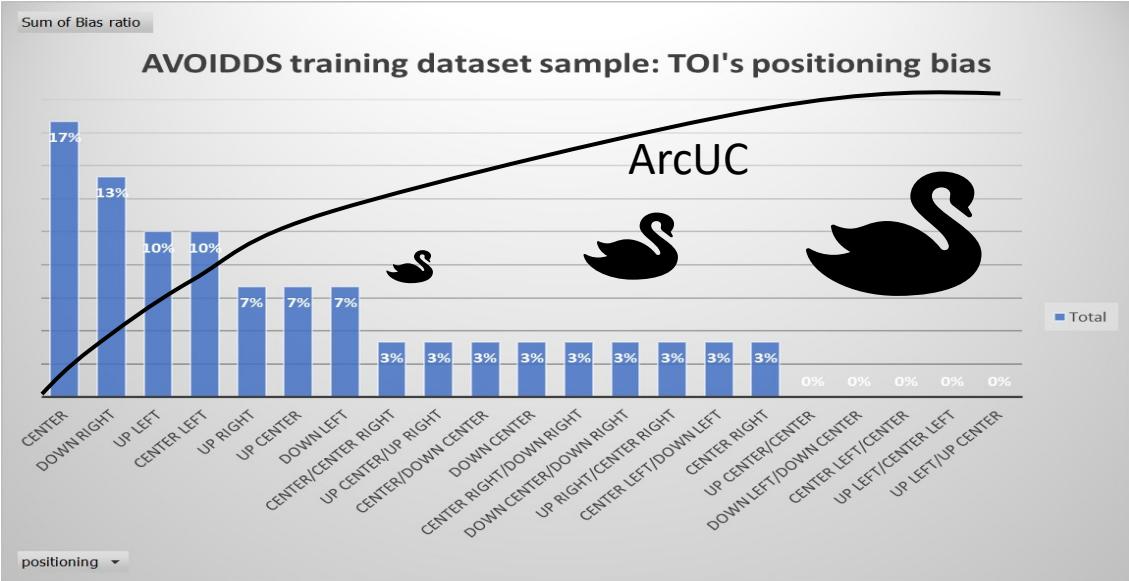
1. dangerously close distances

The lack of exposure constitutes a potential for an exponentially unpredictable high-risk emergent black swan behaviour performed by the perception. Unbalanced coverage leads to a hyperbolic uncertainty profile in the intelligent system's behaviour. [An example incident of a Mid-air collision due to a close but unnoticed approach.](#)

Consequently, the dataset does not satisfactorily fulfil the ALARP requirement for pictorial distance coverage.

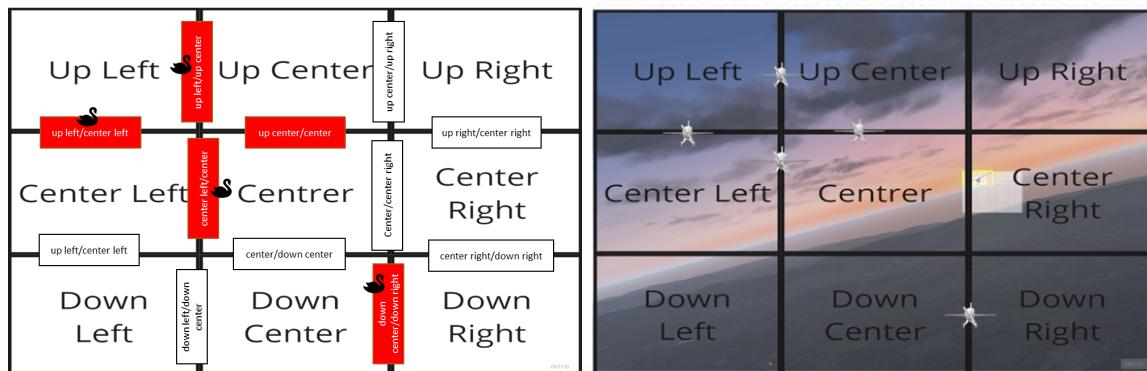


Examining AVOIDDS Training Strategy in Covering TOI's Positioning Training Classes:



The dataset exhibits significant imbalance, with 60% of perception experiencing TOIs only 20% of the possible positioning quadrants. Notably, there is a complete absence experience in the following possible positions:

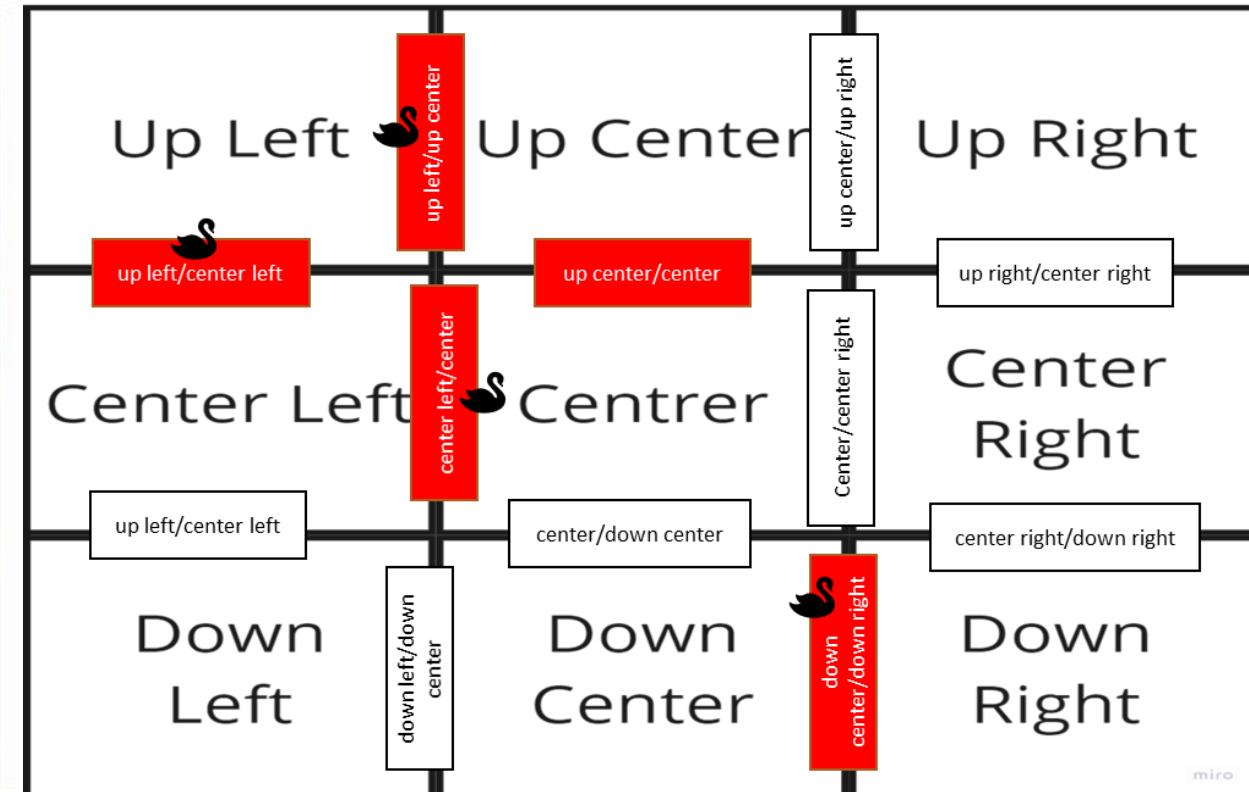
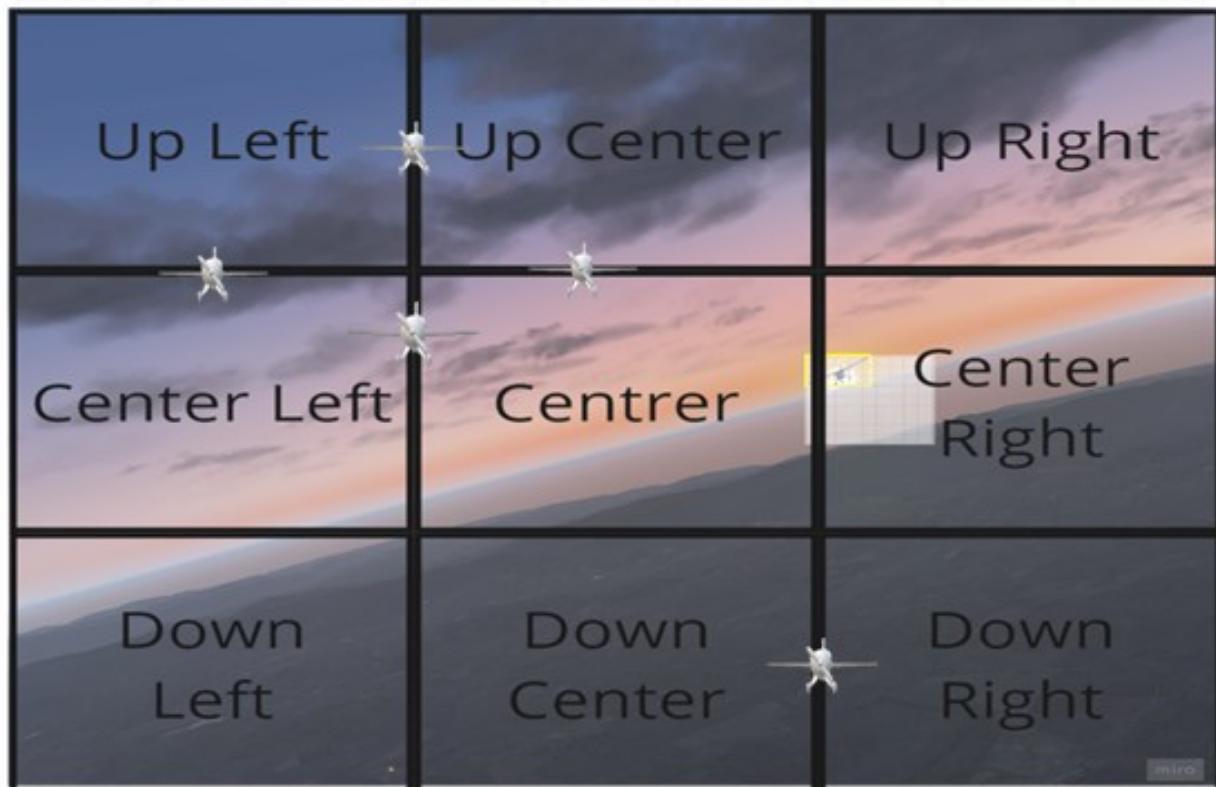
1. up center/center
2. up left/center left
3. center left/center
4. up left/up center
5. down left/down center



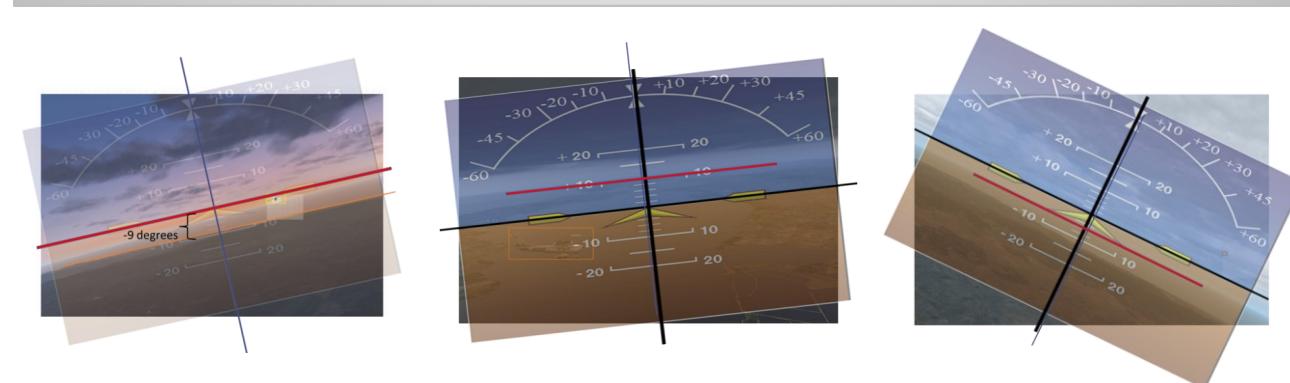
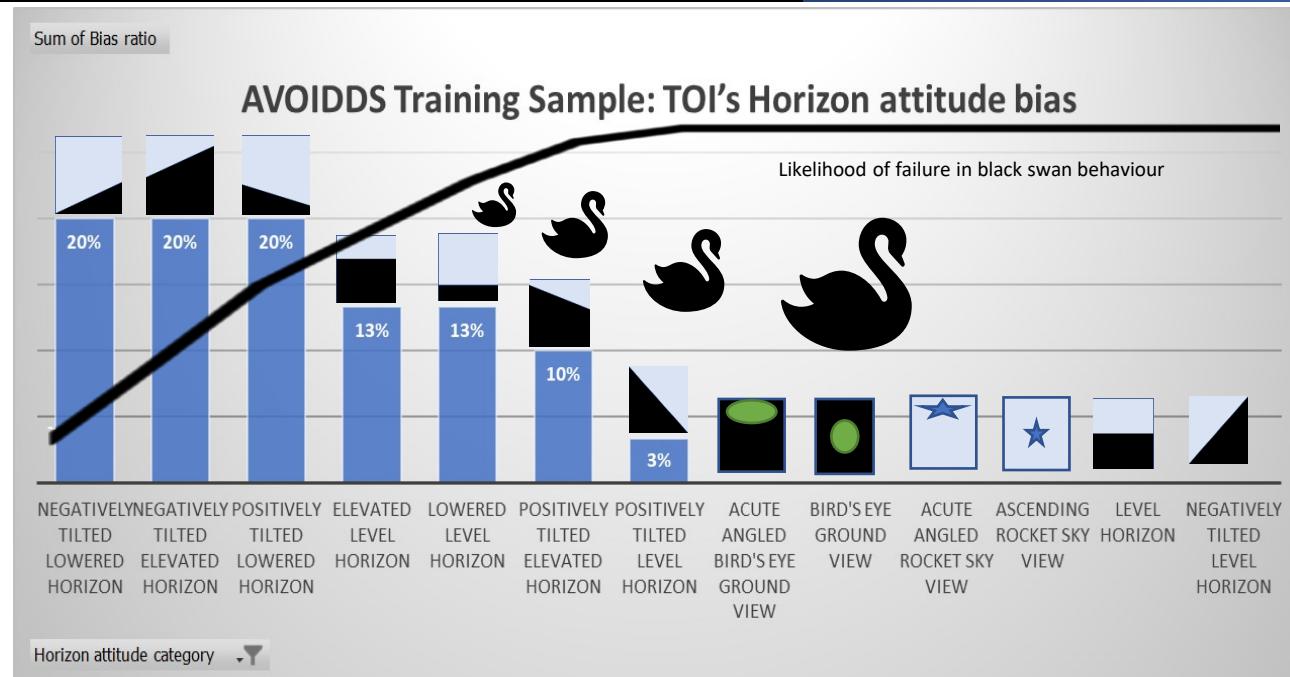
The lack of exposure constitutes a potential for an exponentially unpredictable high-risk emergent black swan behaviour performed by the perception.

Consequently, the dataset does not satisfactorily fulfil the ALARP (As Low As Reasonably Practicable) requirement for TOI's positioning coverage.

Examining AVOIDDS Training Strategy in Covering TOI's Positioning Training Classes:



AVOIDDS Training Sample TOI's Horizon attitude analysis



The dataset exhibits significant imbalance, with 60% of perception experiencing TOIs in only 23% of the possible horizon attitudes. Notably, there is a complete absence of experience in the following possible horizon attitudes:

1. Level Horizon
2. Negatively Tilted Elevated Horizon
3. Acute Angled Bird's Eye Ground View
4. Bird's Eye Ground View
5. Ascending Rocket Sky View
6. Negatively Tilted level Horizon
7. Acute Angled Rocket Sky View

The lack of exposure constitutes a potential for an exponentially unpredictable high-risk emergent black swan behaviour performed by the perception.

Consequently, the dataset needs to satisfactorily fulfil the ALARP (As Low As Reasonably Practicable) requirement in terms of horizon attitude coverage.

Possible Hazards identified

Perception Failure mode	Perception Safety requirement
Ambiguity in Object Identification: Risk: The system might fail to recognize other aircraft when they are at a long distance or have an orientation that makes them difficult to identify. For example, if an aircraft is coming from an unconventional angle (e.g., upside down or tilted), the system might misinterpret its position and distance, leading to incorrect avoidance actions.	Mitigation: The perception system must be trained to handle diverse orientations, particularly those that might appear unconventional due to the flight dynamics of the aircraft or environmental conditions.
Difficulties in Recognizing Distant or Low-Visibility Objects: Risk: In low-light (e.g., night), weather, or long-range scenarios, the system might fail to detect aircraft that are at extreme distances or partially obscured by clouds, smoke, or other atmospheric factors. The system's performance could degrade, especially in critical situations where detection and timely reaction are necessary to avoid collisions.	Mitigation: The system should be trained to handle ambiguous or partial visual information by recognizing objects at varying distances and through weather conditions like broken clouds or low visibility. Proper handling of low-contrast or poorly illuminated objects will ensure that the system remains effective even in suboptimal conditions.
Uncertainty in Aircraft Orientation and Behavior: Risk: Aircraft can appear in various orientations due to their flight path (e.g., ascending, descending, tilted). If the perception system cannot accurately determine the orientation or trajectory of another aircraft, it might misinterpret its movement or predict the wrong course of action. This is particularly dangerous when aircraft are near each other or crossing paths.	Mitigation: The system must be trained to interpret diverse aircraft orientations, especially in scenarios where they might not be level, and to account for dynamic flight behavior. This would ensure that it can differentiate between aircraft in a stable flight path versus those in unusual orientations, thus avoiding collision.

Training Dataset Requirement (retrospective)

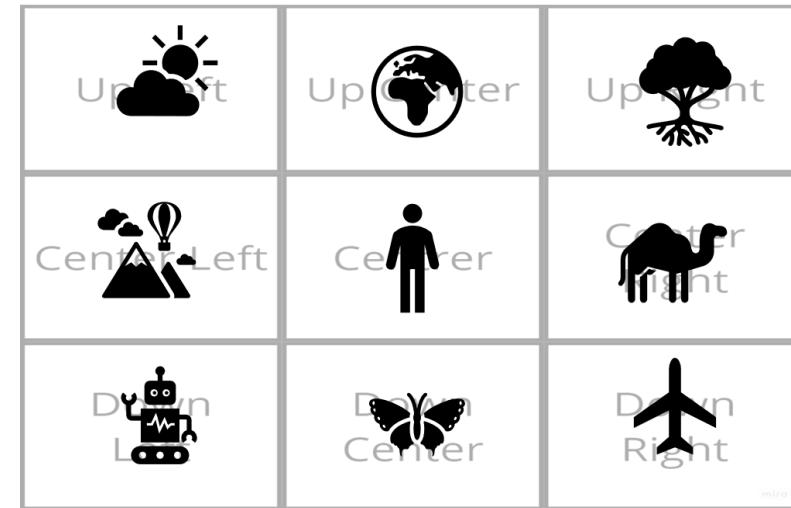
The dataset shall expose the perception model to the following experiences:

1. a **single engine propeller aircraft{1.1}** centrally positioned{2.1} under broken clouds{3.1} in the Early Morning {4.1}, with its rear tilted up-left{5.1}, at a **recognisable distance{6.1}**, against a **Negatively Tilted Lowered Horizon{7.1}**.
2. A Mid-Morning{4.2}image, where the aircraft is **center-left{2.3}**, at a **moderately recognisable distance{6.3}**, with a **front-up-right orientation{5.2}**, framed against a **Lowered Level Horizon{7.3}**.
3. A night {4.3} depiction with the **aircraft {1.1}** toward the **centre and centre-right{2.4}**, at an **extremely unrecognisable distance{6.2}**, its **front tilted downward left {5.4}**, against a **Positively Tilted Elevated Horizon{7.5}**.
4. A Night{4.4} scene with the **aircraft {1.1}** centred{2.1}, at an **extremely unrecognisable distance{6.2}**, oriented to the **right{5.3}**, under a **Negatively Tilted Elevated Horizon{7.4}**.
5. A scene **in the Early Morning {4.1}** with the **aircraft{1.1}** in the **Down-right corner{2.2}**, at an **extremely unrecognisable distance{6.2}**, against a **Positively Tilted Lowered Horizon{7.2}**, with its [missing orientation].

AI Training CuneiForms

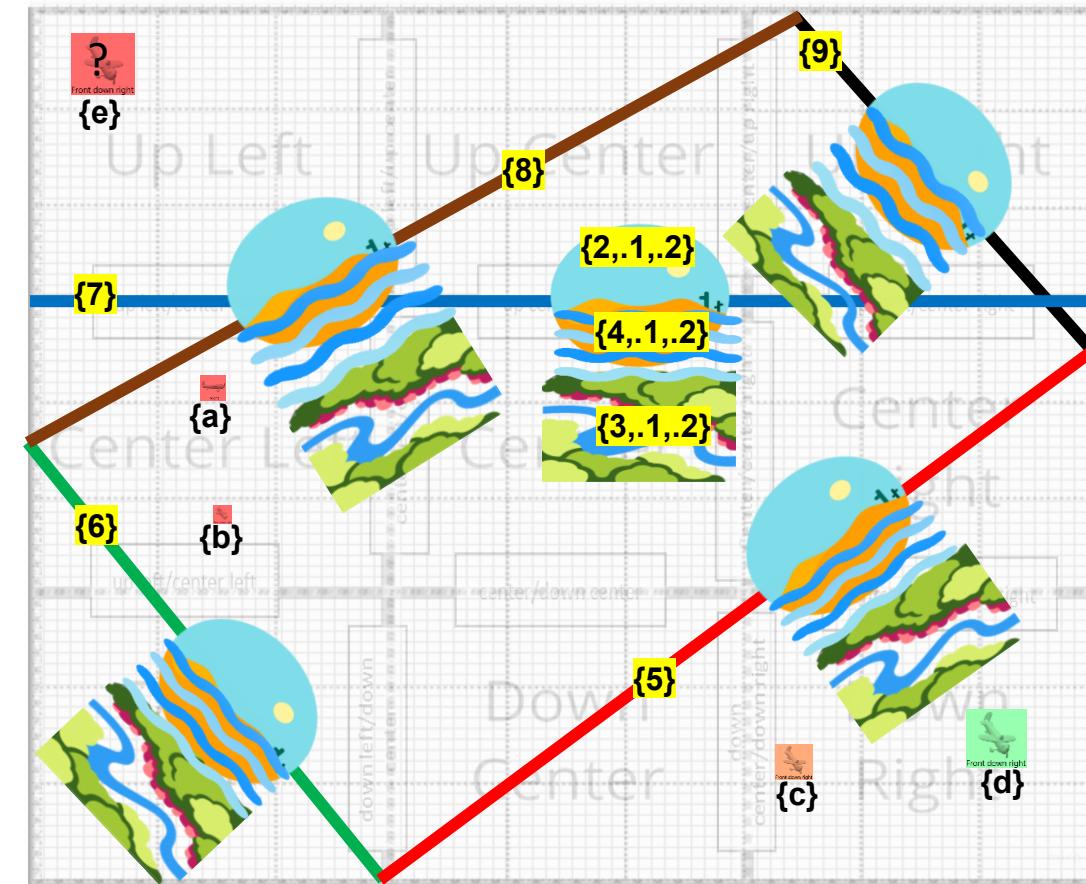
We retrospectively produced CuneiForms for the training to illustrate how the CuneiForm can be designed.

AI Training CuneiForm 0



Abstract CuneiForm Characteristics (dimensions)	Abstract CuneiForm Characteristics definitions
TOIs definition and their aesthetic complexity	Single-engine propeller aeroplane {1}
TOI Motion and Dynamic optical states	Motion trajectory: Linear motion captured in consecutive images where the aeroplane appears to move in a straight line at a constant speed (no acceleration) {1.2}. Dynamic optical state: captured without optical blur {1.3}.
Background Objects associated with TOIs	Clear sky{2} green-terrain {3} water surface{4}
Background Objects Motion and Dynamic optical states	Motion trajectory: is static {2.1,3.1,4.1} Dynamic optical state: no motion blur{2.2,3.2,4.2}
Visible horizon attitude	Negatively Tilted Lowered Horizon{5} Positively Tilted Lowered Horizon{6} Elevated Level Horizon{7} Negatively Tilted Elevated Horizon{8} Positively Tilted Elevated Horizon{9}
TOI's Pictorial Positioning	up center{1.4} Down right{1.5} center left{1.6}
TOI's Pictorial Distance	recognisable TOI distance{1.8}, moderately recognisable TOI distance{1.9}, extremely unrecognisable TOI distance{1.10},
TOI's 3D Orientation	front down right{1.11} rear down right{1.12} right{1.13} Unknown{??}

AI Training CuneiForm 0



Training TOIs

{1,2,.3,.6,.10,.13}

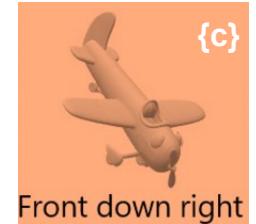


Right

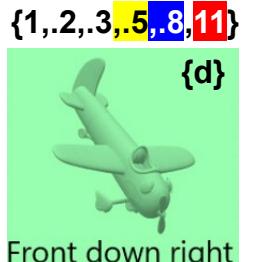


Rear down right

{1,2,.3,.5,.9,11}

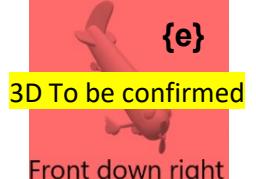


Front down right



Front down right

{1,2,.3,.5,10,?}

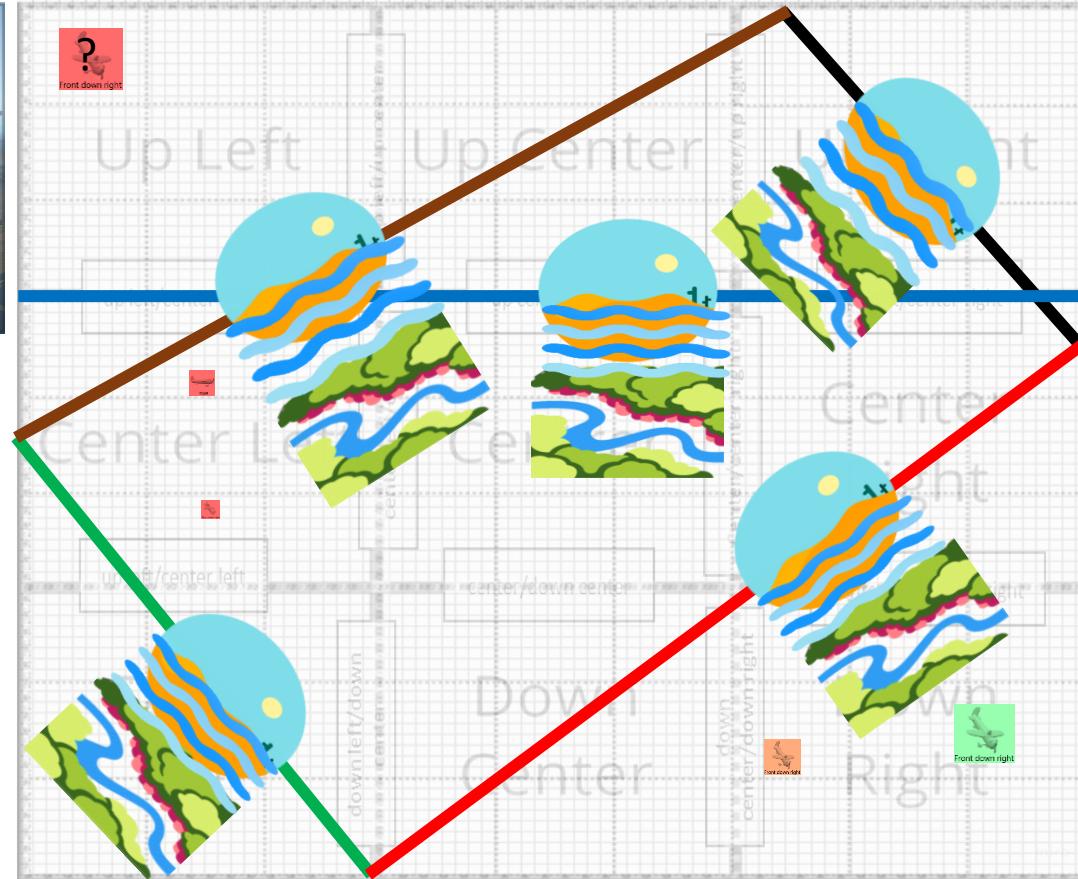


3D To be confirmed
Front down right

Instantiated Image	cessna_ac_training0
	cessna_ac_training1
	cessna_ac_training2
	cessna_ac_training3
	cessna_ac_training4

Time of Day	Evening (Dusk) Midday (Noon) Morning Night

AI Training CuneiForm 0

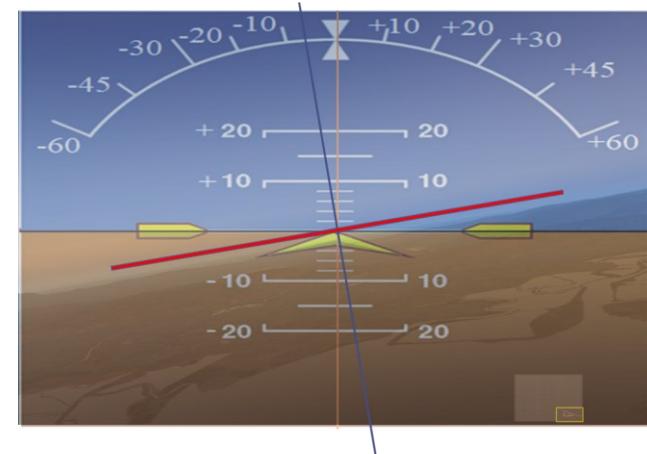
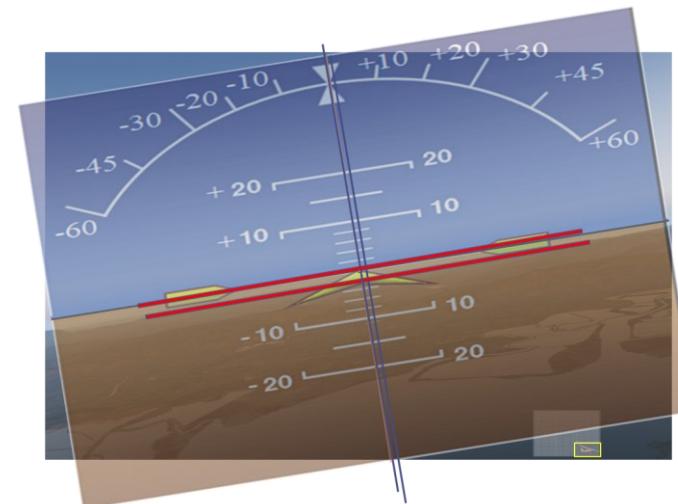
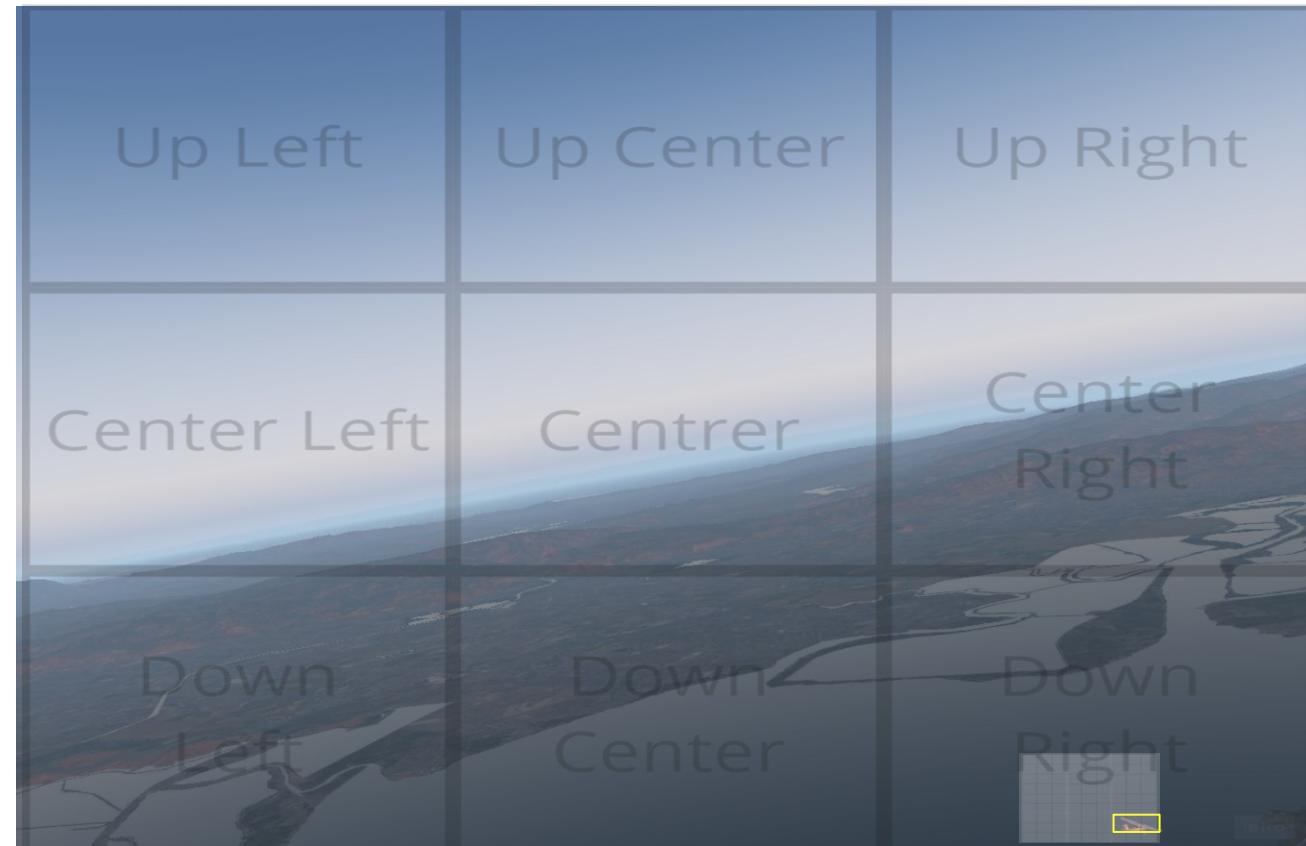


0.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	Evening (Dusk). 18:15:31

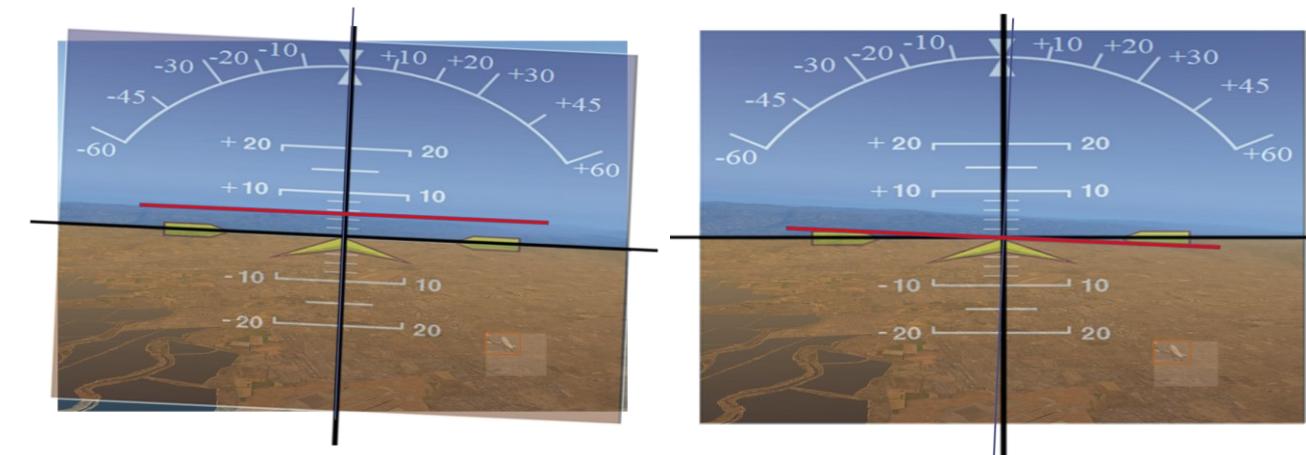
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/6 = 1093.5$
TOI's Pictorial positioning	Down right
TOI's 3D orientation	front down right

Horizon attitude Roll: -5, Pitch: -2



1.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	late afternoon, 19:20:53
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/15 = 437.4$
TOI's Pictorial positioning	down right
TOI's 3D orientation	front down right
Horizon attitude	Roll: 1, Pitch: 7

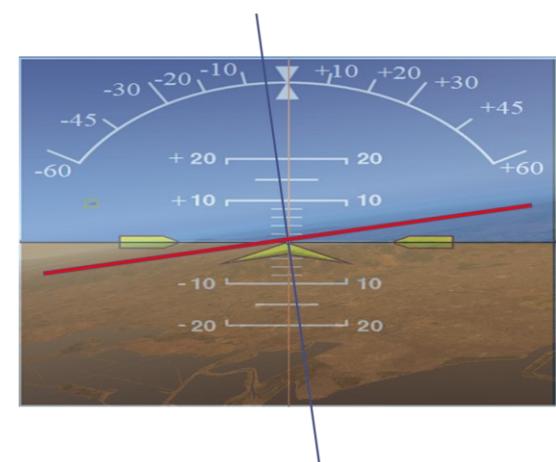
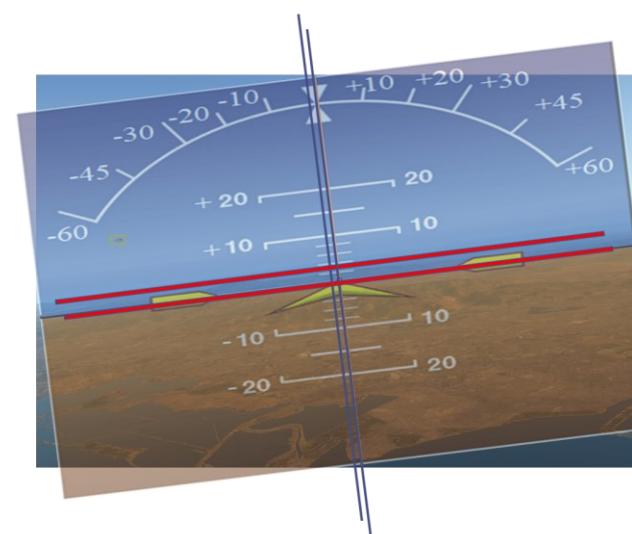


2.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	Midday (Noon), 11:16:17
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/2 = 3280.5$
TOI's Pictorial positioning	center left
TOI's 3D orientation	right
Horizon attitude	Roll: -5, Pitch: 3

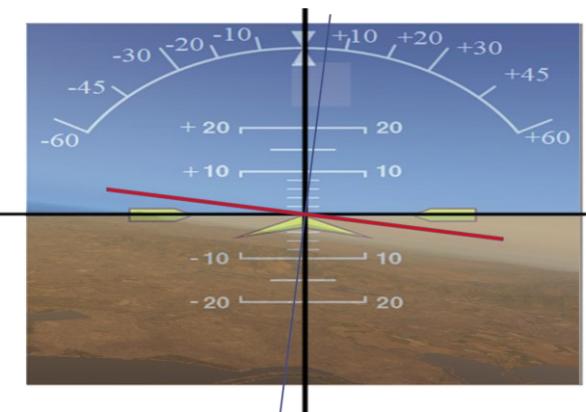
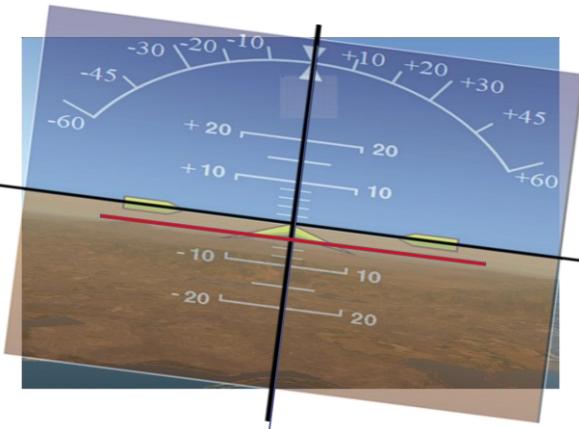
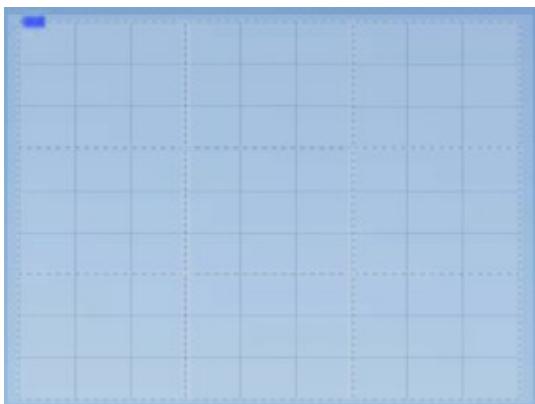


Right



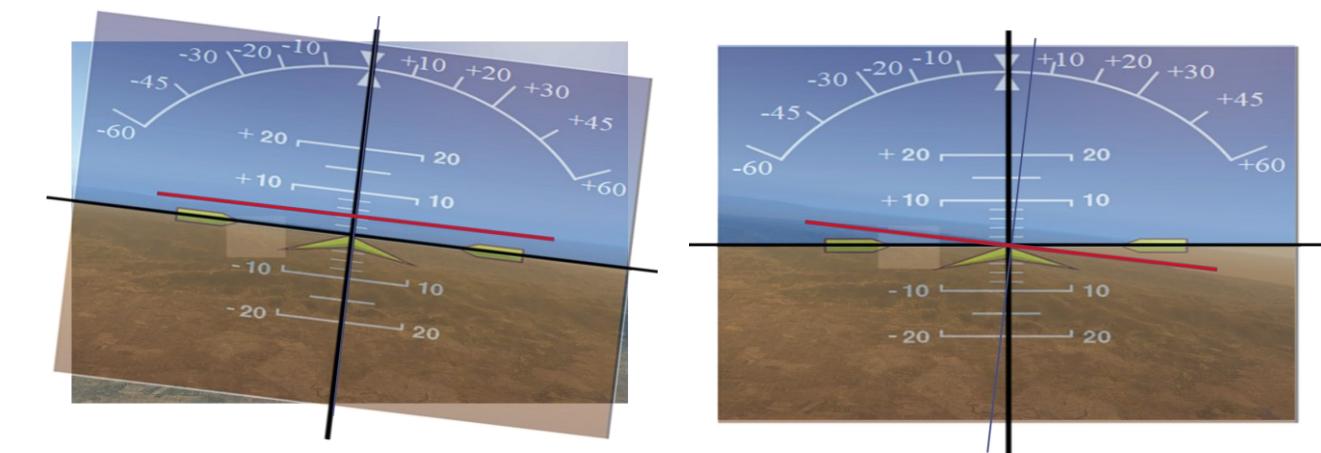
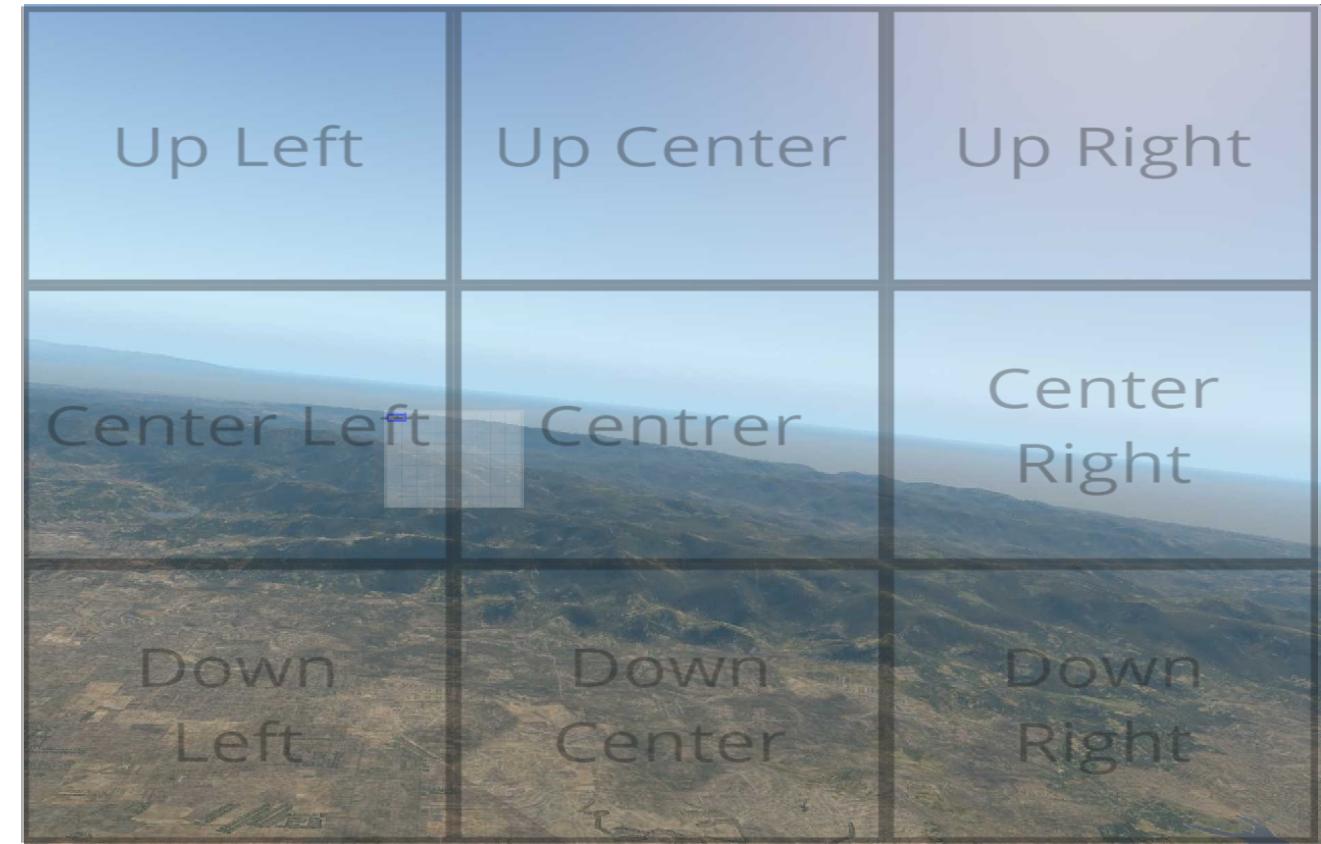
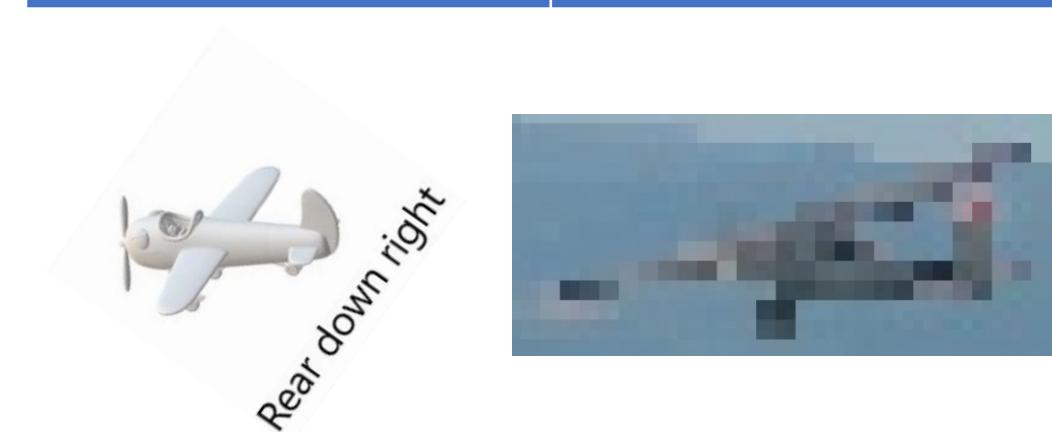
3.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	morning, 08:29:51
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/0.2
TOI's Pictorial positioning	up center
TOI's 3D orientation	Unknown
Horizon attitude	Roll: 5, Pitch: -4

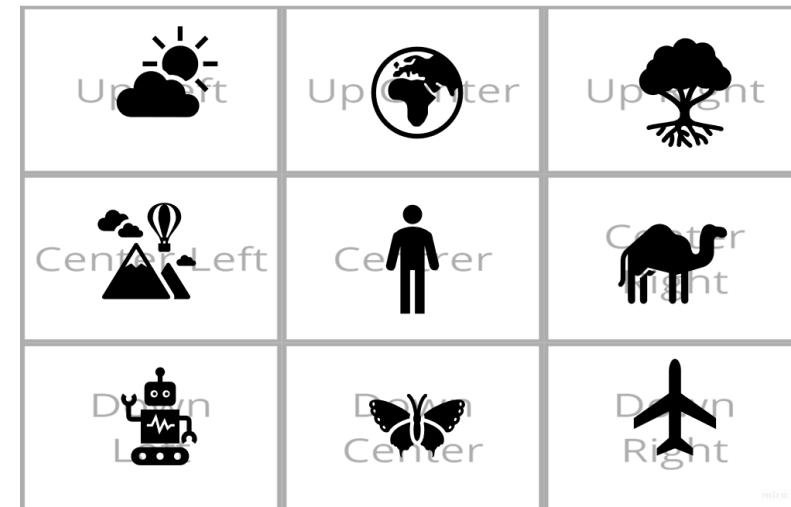


4.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	Morning, 01:44:03
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	center left
TOI's 3D orientation	rear down right
Horizon attitude	Roll: 5, Pitch: 4

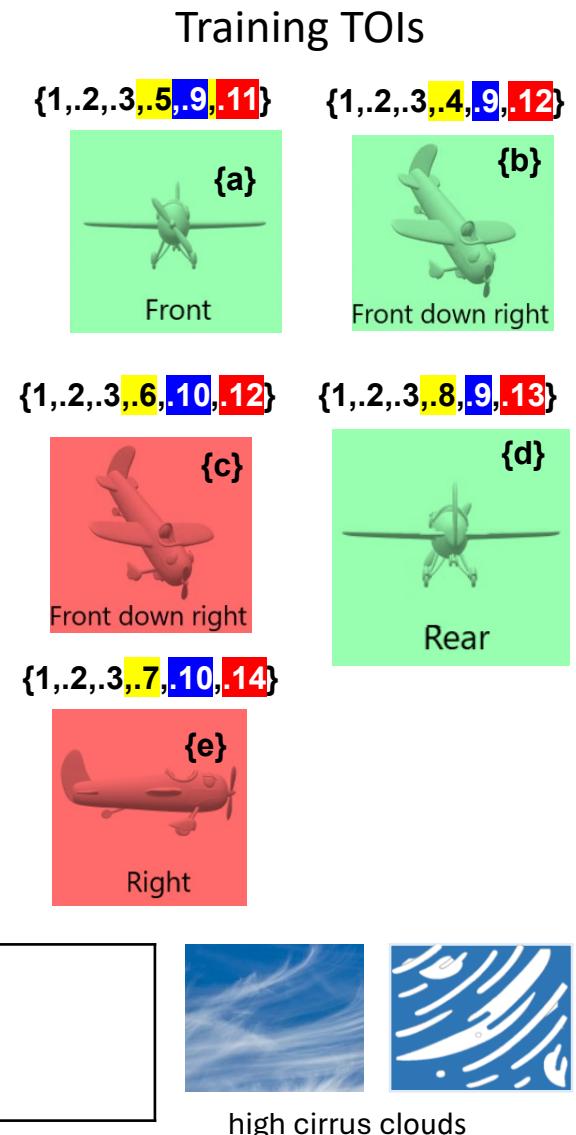
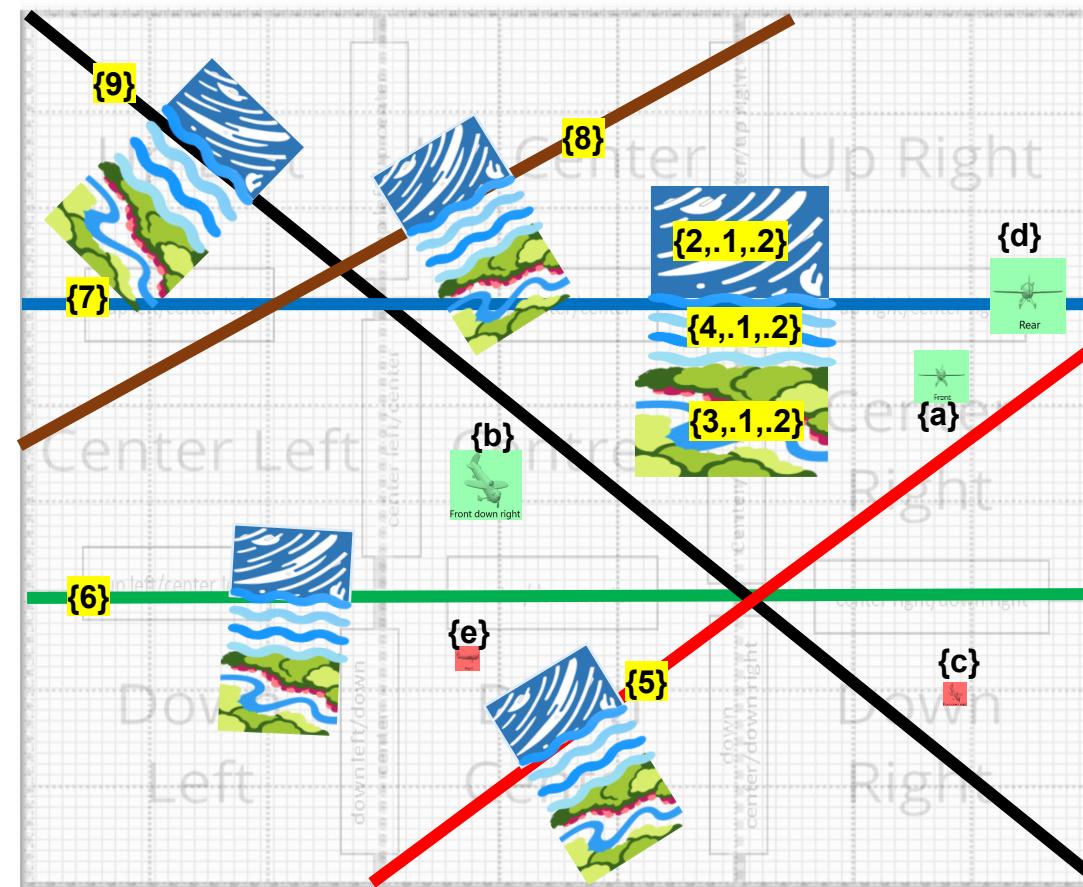


AI Training CuneiForm 1



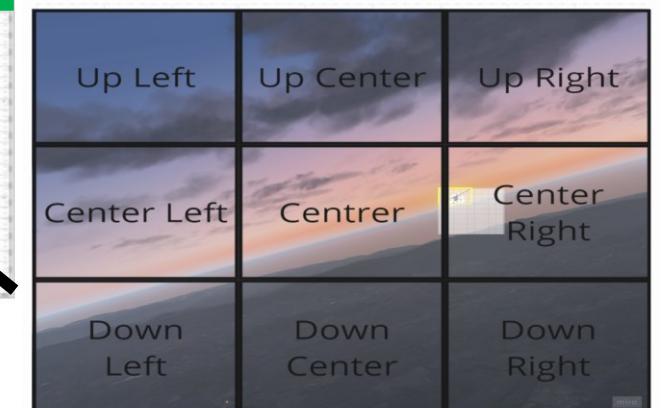
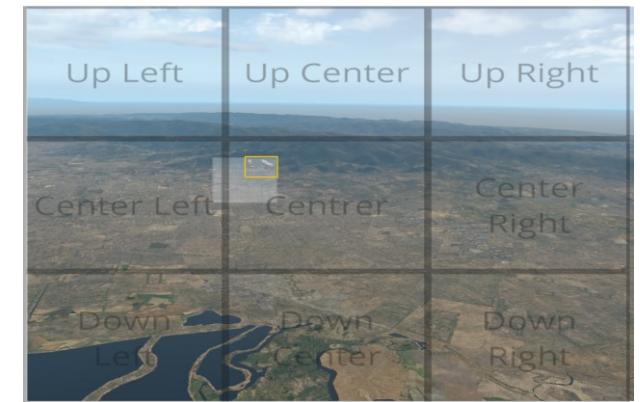
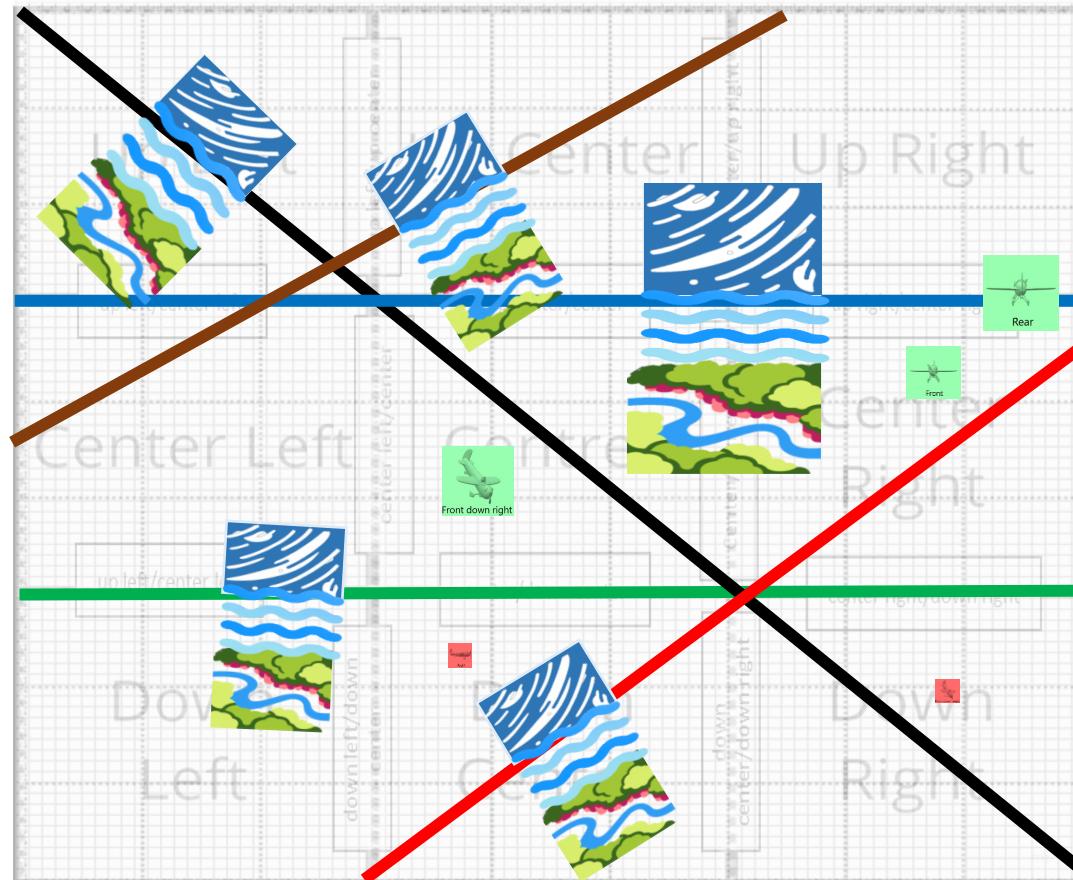
Abstract CuneiForm Characteristics (dimensions)	Abstract CuneiForm Characteristics definitions
TOIs definition and their aesthetic complexity	Single-engine propeller aeroplane {1}
TOI Motion and Dynamic optical states	Motion trajectory: Linear motion captured in consecutive images where the aeroplane appears to move in a straight line at a constant speed (no acceleration) {1.2}. Dynamic optical state: captured without optical blur {1.3}.
Background Objects associated with TOIs	high cirrus clouds{2} green-terrain {3} water surface{4}
Background Objects Motion and Dynamic optical states	Motion trajectory: is static {2.1,3.1,4.1} Dynamic optical state: no motion blur{2.2,3.2,4.2}
Visible horizon attitude	Negatively Tilted Lowered Horizon{5} Lowered Level Horizon{6} Elevated Level Horizon{7} Negatively Tilted Elevated Horizon{8} Positively Tilted Level Horizon{9}
TOI's Pictorial Positioning	Center{1.4} center right{1.5} center right/down right{1.6} down center{1.7} up right/center right{1.8}
TOI's Pictorial Distance	recognisable TOI distance{1.9}, extremely unrecognisable TOI distance{1.10},
TOI's 3D Orientation	Front{1.11} front down right{1.12} rear{1.13} right{1.14}

AI Training CuneiForm 1



AI Training CuneiForm 1

The clouds in AVVOIDS training do not validate the cuneiform.

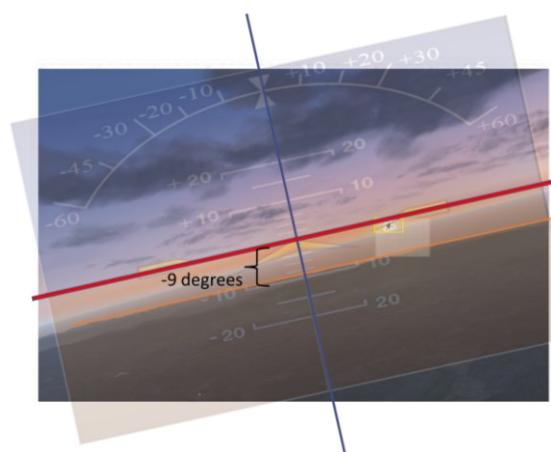


AVOIDDS Sample Training: 10.jpg

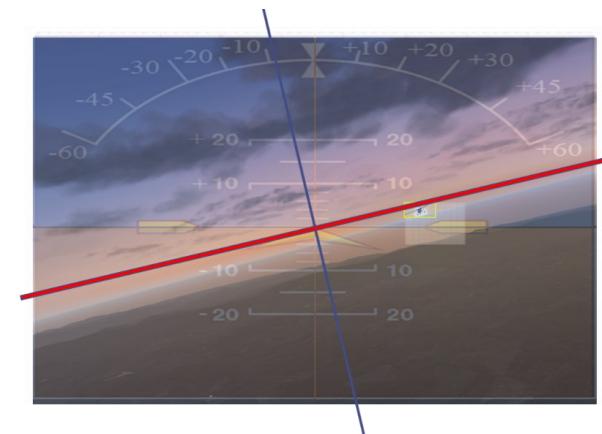
ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	Evening (Dusk) 18:11:31
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/15 = 437.4$
TOI's Pictorial positioning	center right
TOI's 3D orientation	Front
Horizon attitude	Roll: -10, Pitch: -9



PHI pitch angle



PHI roll angle

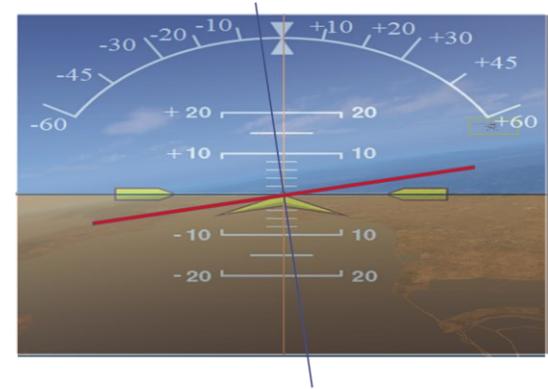
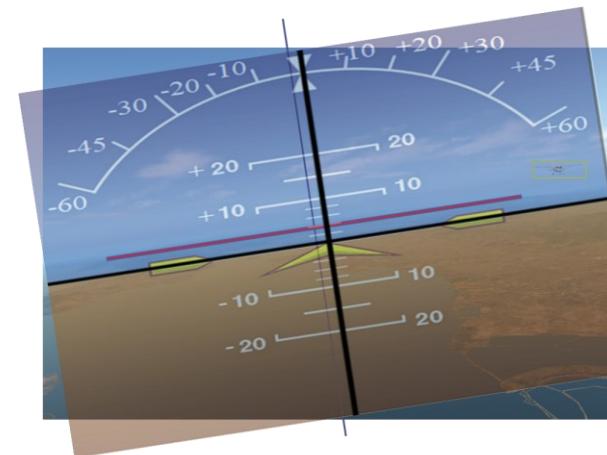


14.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	Evening (Dusk), 19:42:11
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/21 = 312.4$
TOI's Pictorial positioning	up right/center right
TOI's 3D orientation	rear
Horizon attitude	Roll: -5, Pitch: 4

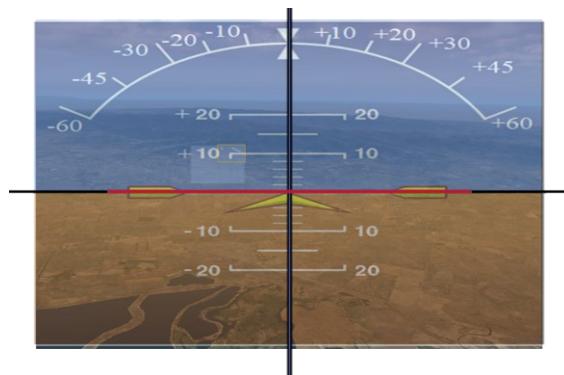
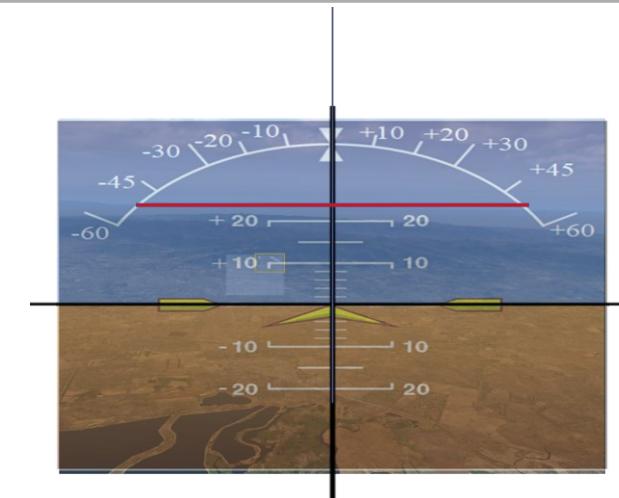


Rear



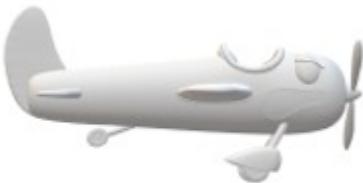
12.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	late afternoon
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/12 = 546.75$
TOI's Pictorial positioning	center
TOI's 3D orientation	front down right
Horizon attitude	Roll: 0, Pitch: 25

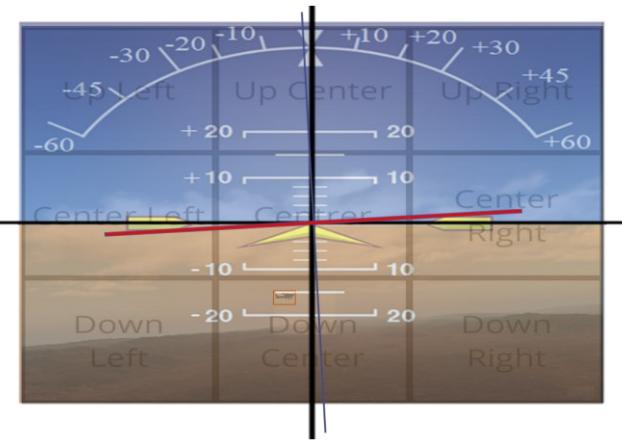
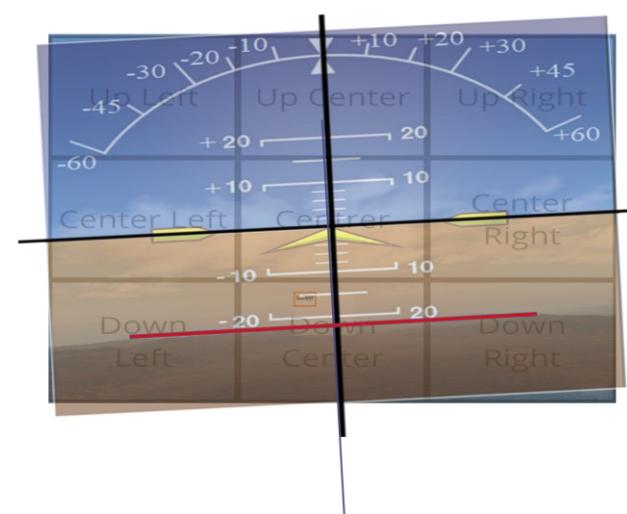
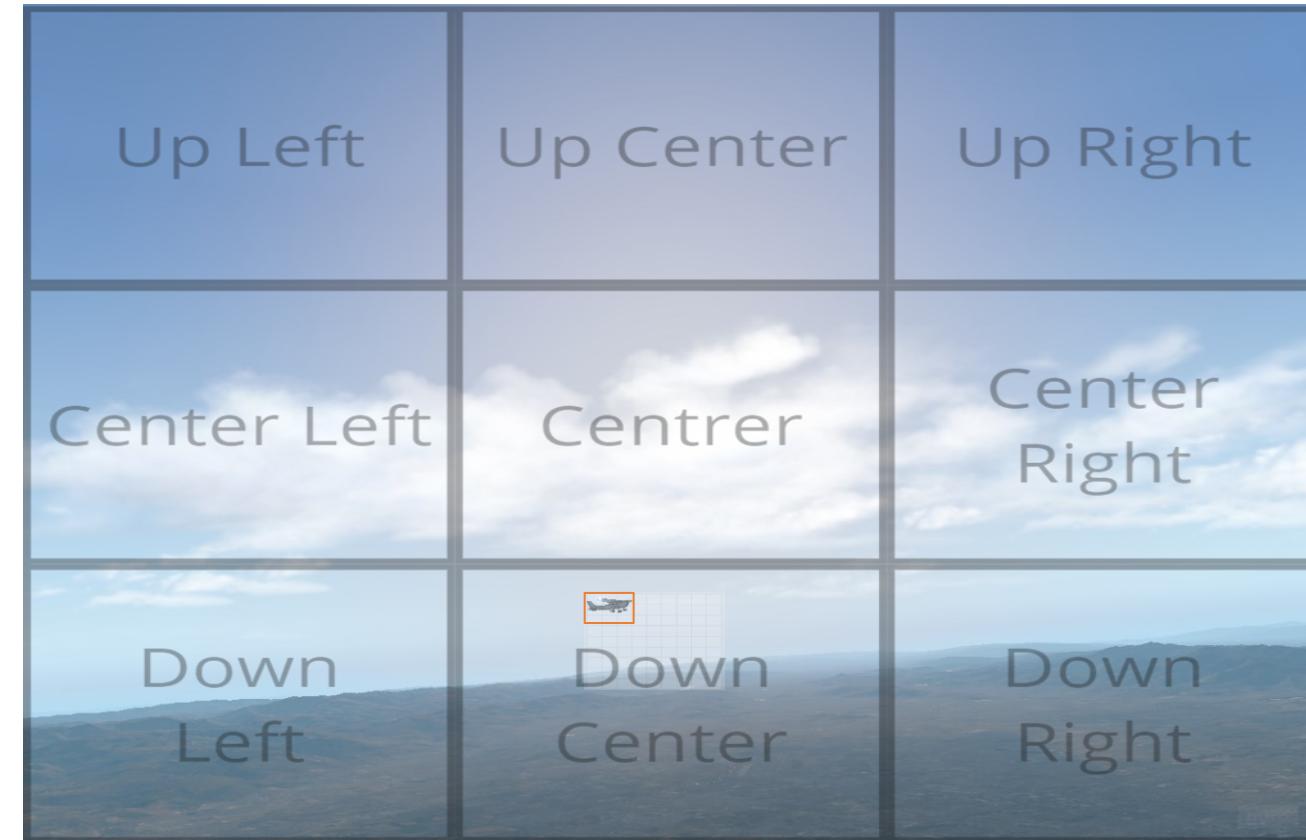


13.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	afternoon,
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/6
TOI's Pictorial positioning	down center
TOI's 3D orientation	right
Horizon attitude	Roll: -1, Pitch: -22



Right

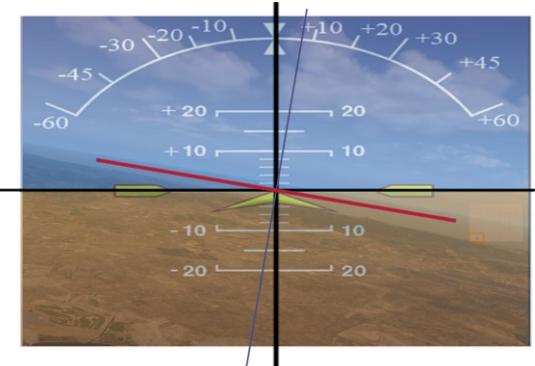
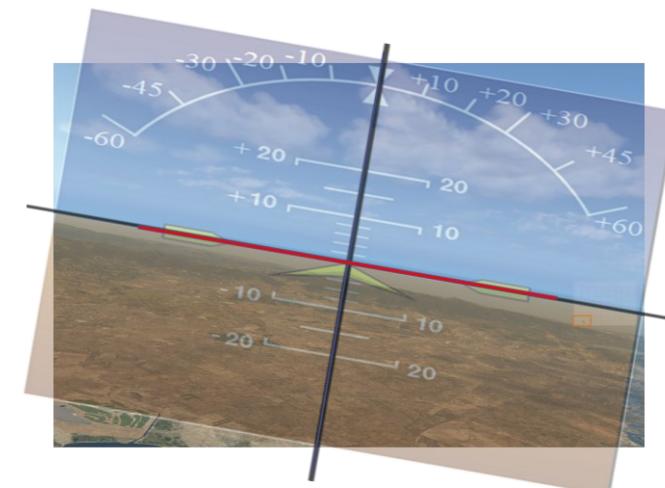
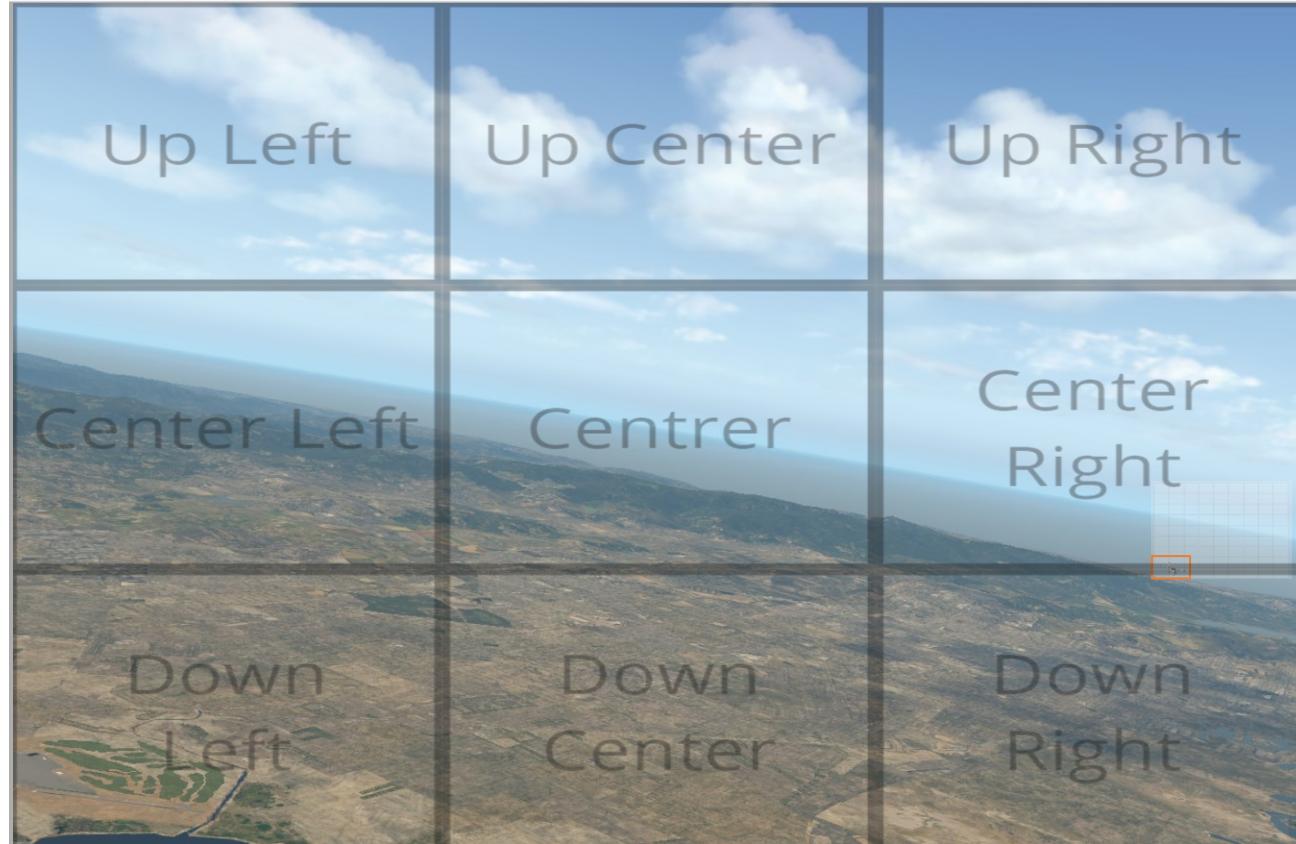


11.jpg

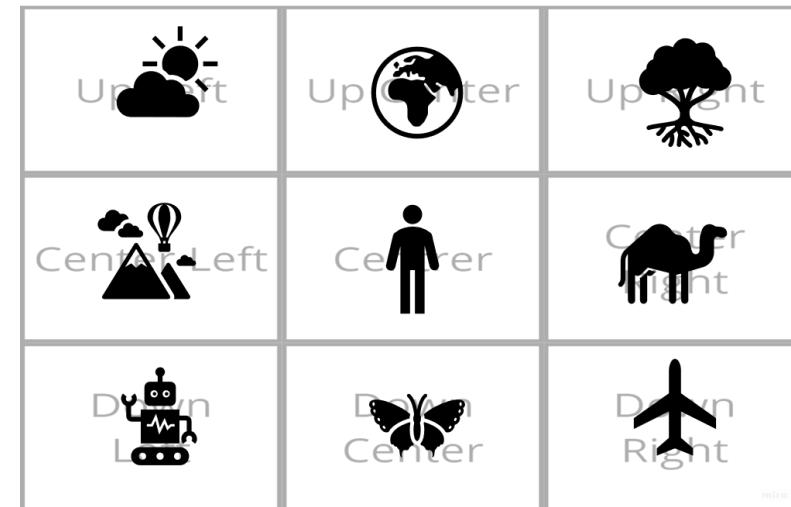
ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	morning, 03:58:23
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/4 = 1640.25$
TOI's Pictorial positioning	center right/down right
TOI's 3D orientation	front down right
Horizon attitude	Roll: 5, Pitch: 0



Front down right

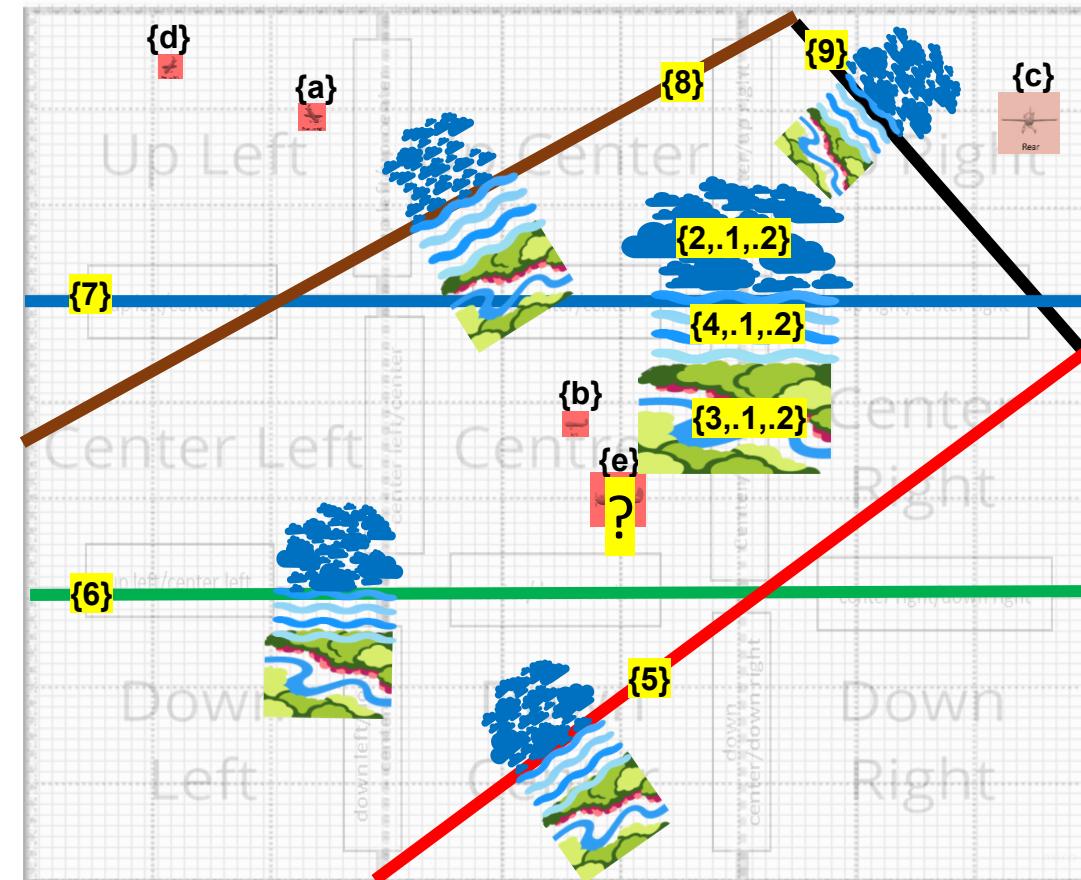


AI Training CuneiForm 2



Abstract CuneiForm Characteristics (dimensions)	Abstract CuneiForm Characteristics definitions
TOIs definition and their aesthetic complexity	Single-engine propeller aeroplane {1}
TOI Motion and Dynamic optical states	Motion trajectory: Linear motion captured in consecutive images where the aeroplane appears to move in a straight line at a constant speed (no acceleration) {1.2}. Dynamic optical state: captured without optical blur {1.3}.
Background Objects associated with TOIs	Scattered Clouds{2} green-terrain {3} water surface{4}
Background Objects Motion and Dynamic optical states	Motion trajectory: is static {2.1,3.1,4.1} Dynamic optical state: no motion blur{2.2,3.2,4.2}
Visible horizon attitude	Negatively Tilted Lowered Horizon{5} Lowered Level Horizon{6} Elevated Level Horizon{7} Negatively Tilted Elevated Horizon{8} Positively Tilted Elevated Horizon{9}
TOI's Pictorial Positioning	center{1.4} Up left{1.5} up right{1.6}
TOI's Pictorial Distance	Moderately recognisable TOI distance{1.7}, extremely unrecognisable TOI distance{1.8},
TOI's 3D Orientation	Left{1.9} Rear{1.10} Rear up left{1.11} rear up right{1.12} Unknown{?}

AI Training CuneiForm 2

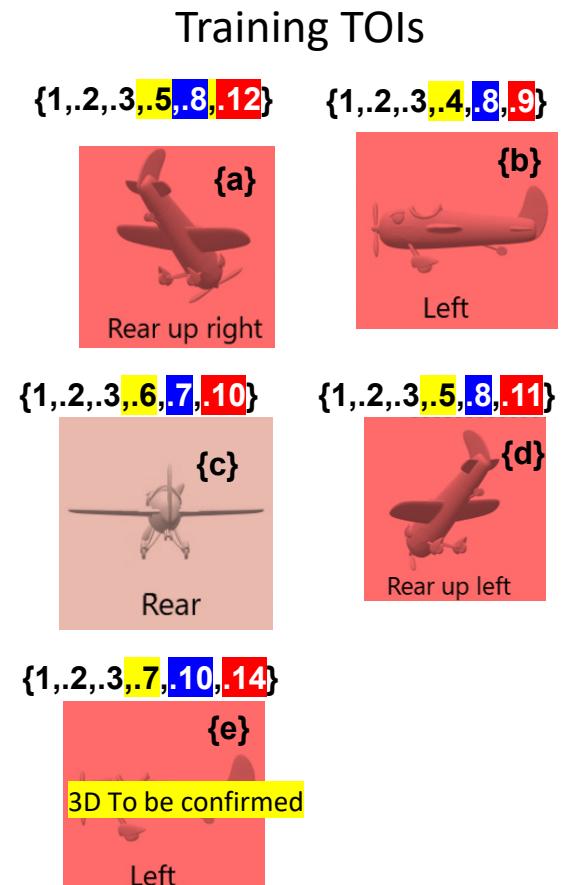


Instantiated Image
cessna_ac_training20
cessna_ac_training21
cessna_ac_training22
cessna_ac_training23
cessna_ac_training24

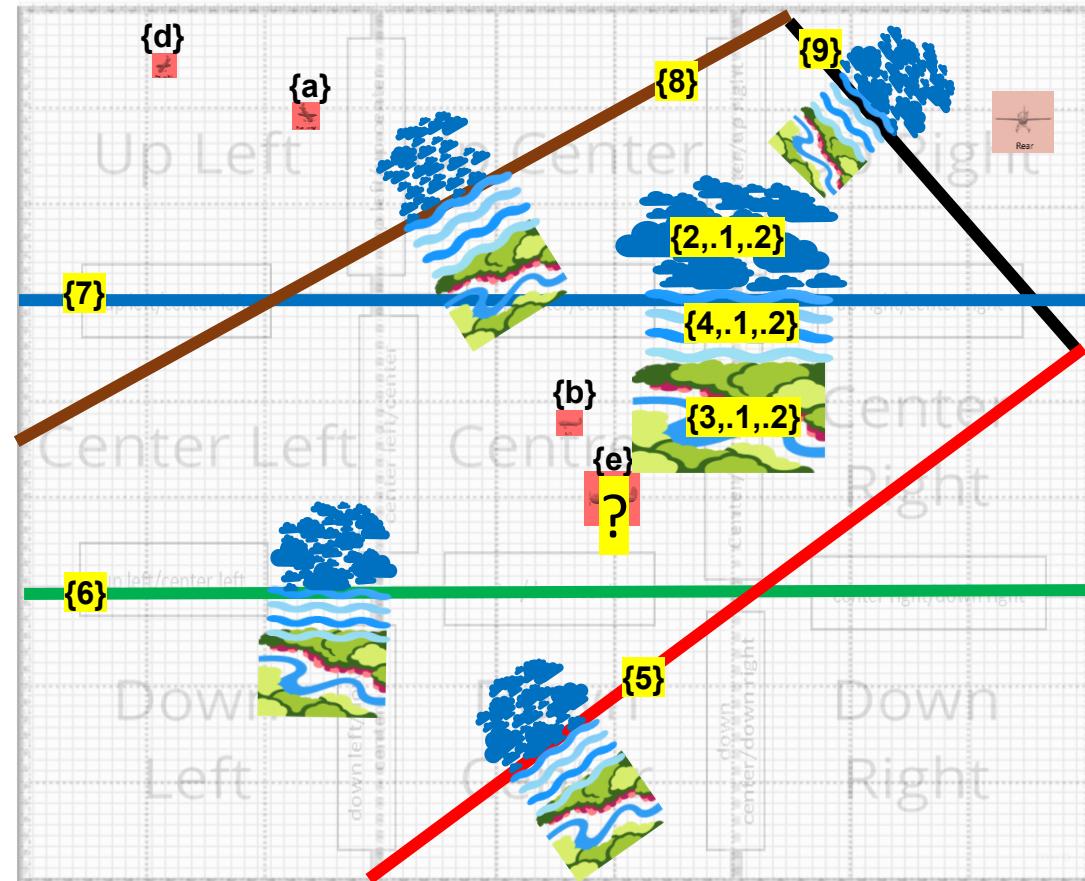
Time of Day
Evening (Dusk)
Midday (Noon)
Morning
Night



Scattered clouds



AI Training CuneiForm 2

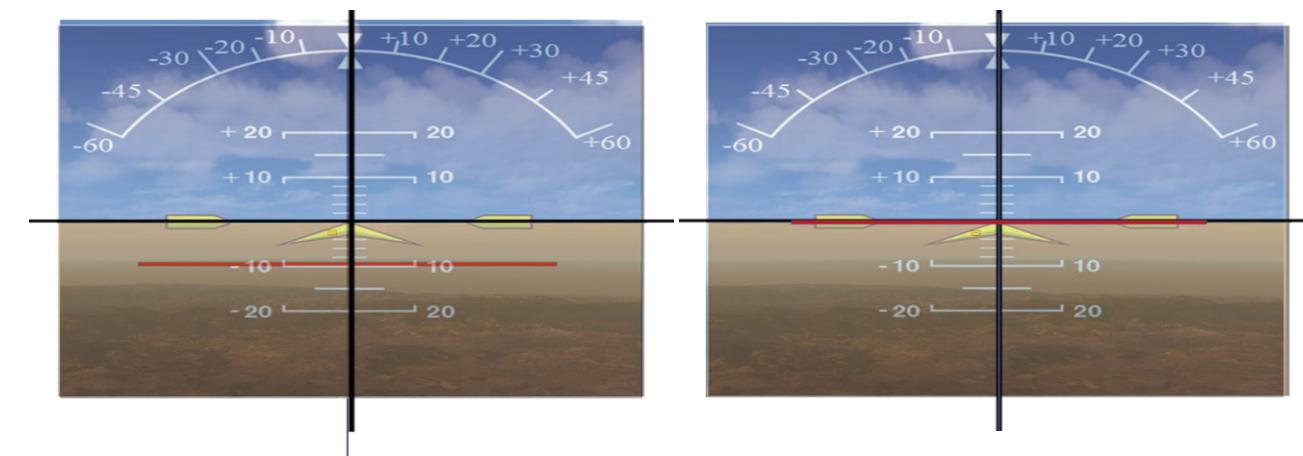
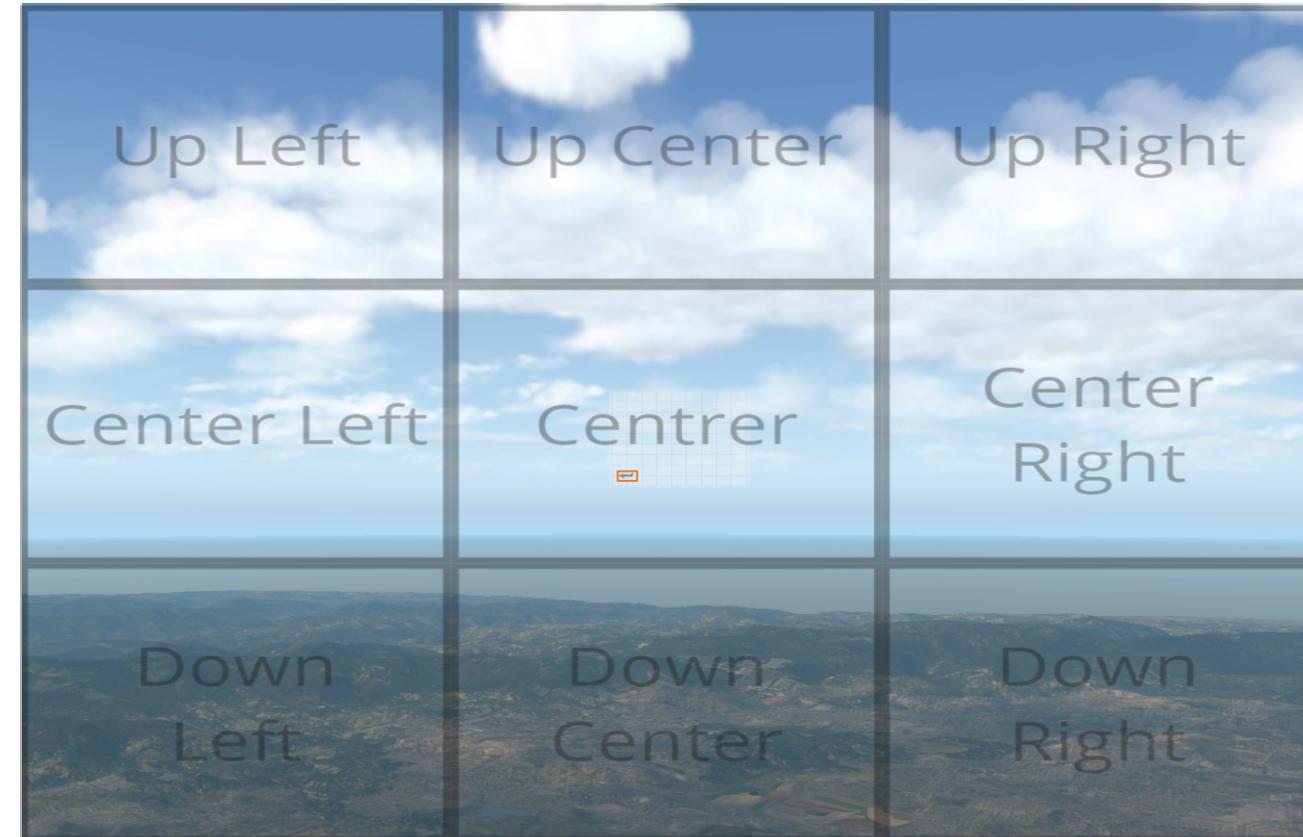
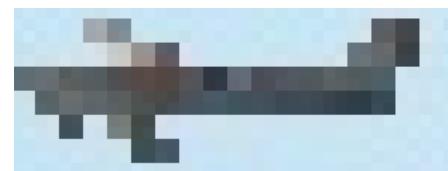


20.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	morning, 08:12:49
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	center
TOI's 3D orientation	left
Horizon attitude	Roll: 0, Pitch: -10



Left



AVOIDDS Sample Training:

21.jpg

ODD Dimension	Training class spec
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Weather Conditions scattered clouds

Time of Day Morning 06:56:32

CuneiForm Dimension	Training class spec
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TOI's pictorial distance (nindans) $6561/2 = 3280.5$

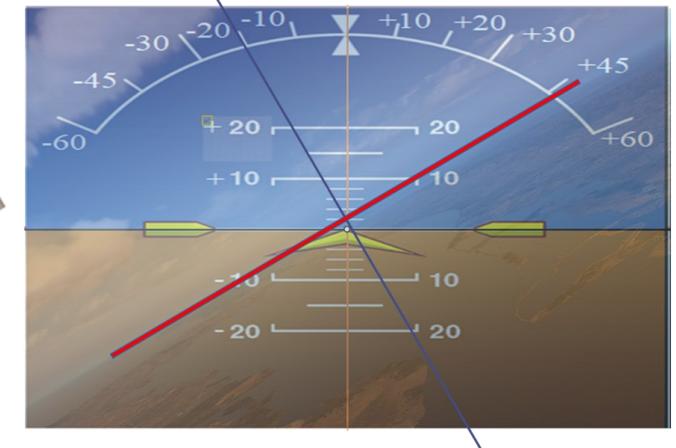
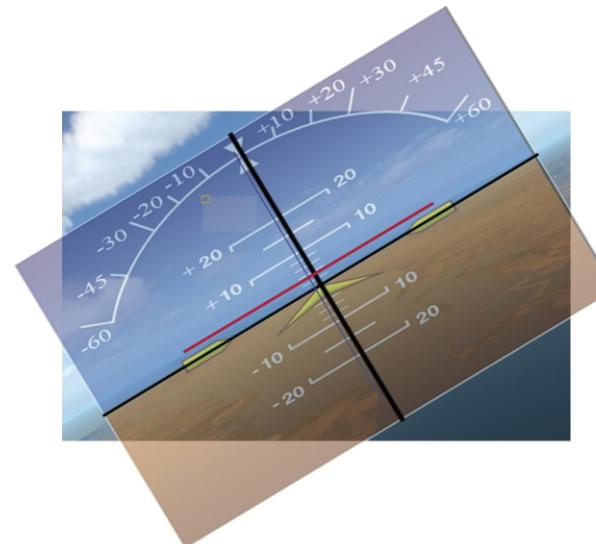
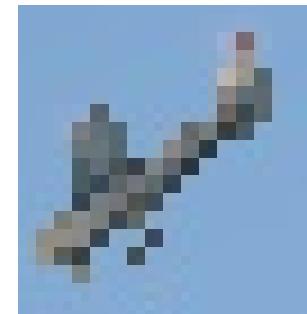
TOI's Pictorial positioning Up left

TOI's 3D orientation Rear up left

Horizon attitude Roll: -11, Pitch: +3



Rear up left

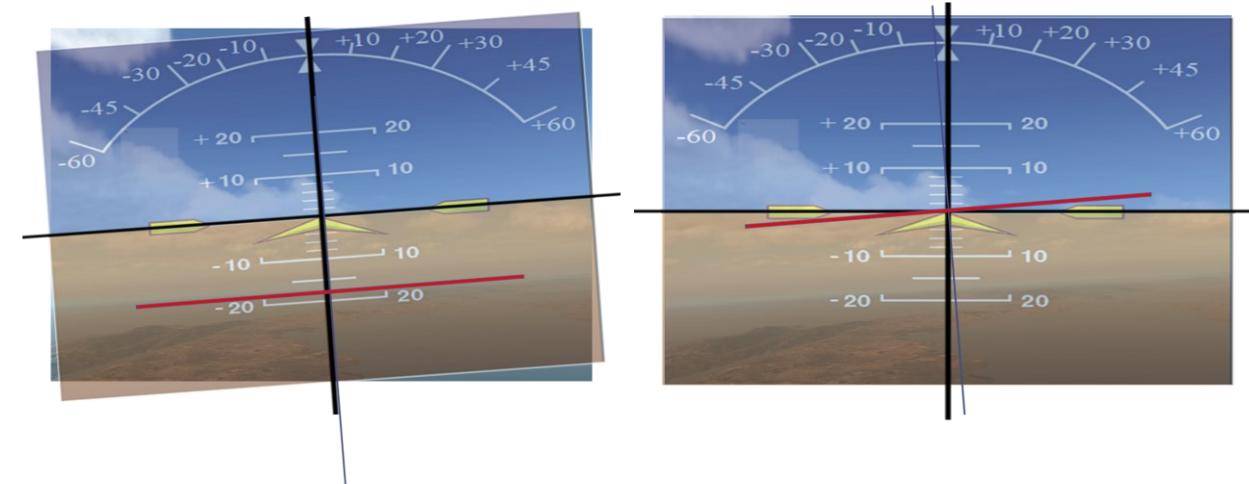


22.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	morning, 01:14:22
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	Up left
TOI's 3D orientation	rear up right
Horizon attitude	Roll: -2, Pitch: -18

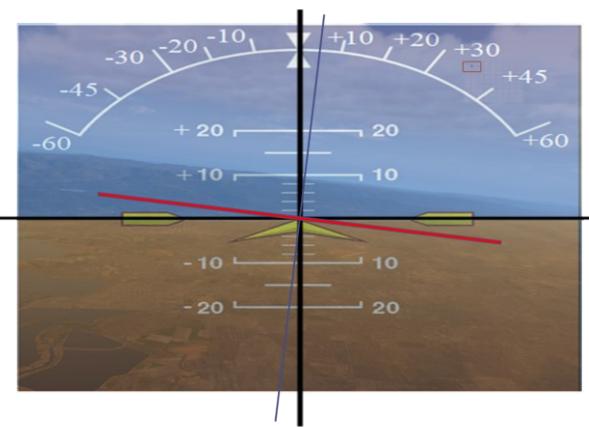
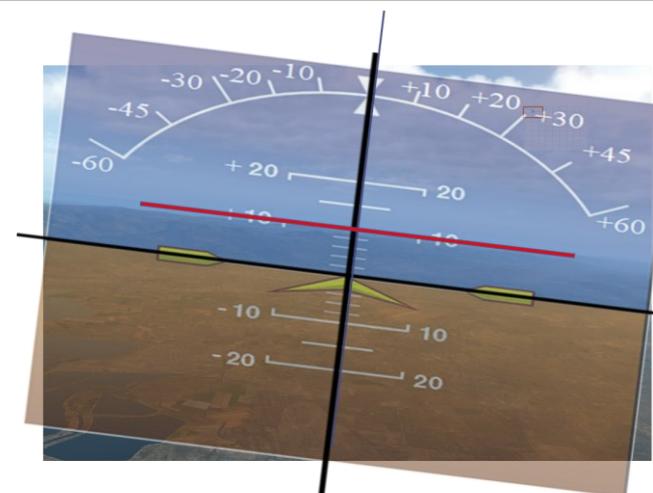


Rear up right



23.jpg

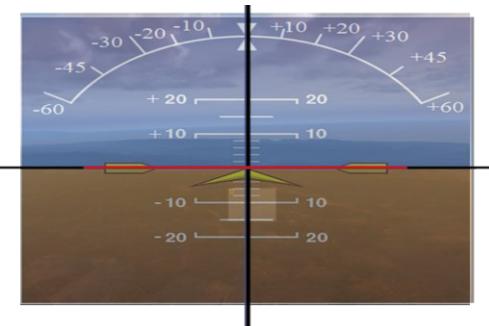
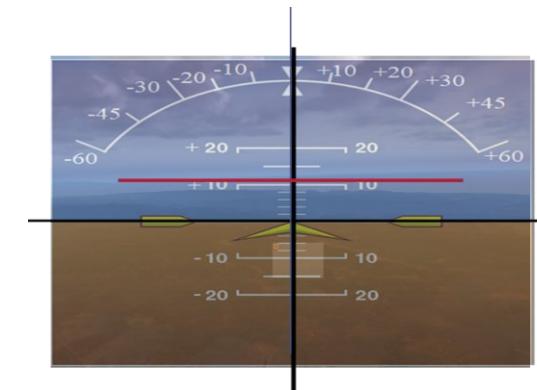
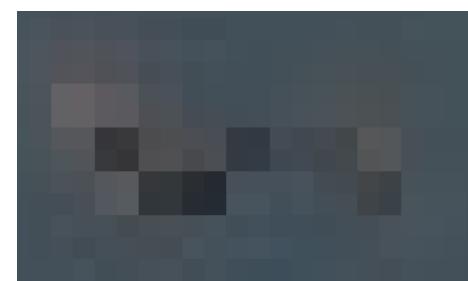
ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	late afternoon, 20:41:29
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/6 = 1093.5$
TOI's Pictorial positioning	up right
TOI's 3D orientation	rear
Horizon attitude	Roll: 5, Pitch: 10



24.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	midday, 12:14:28
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	center
TOI's 3D orientation	Unknown
Horizon attitude	Roll: 0, Pitch: 11

3D?

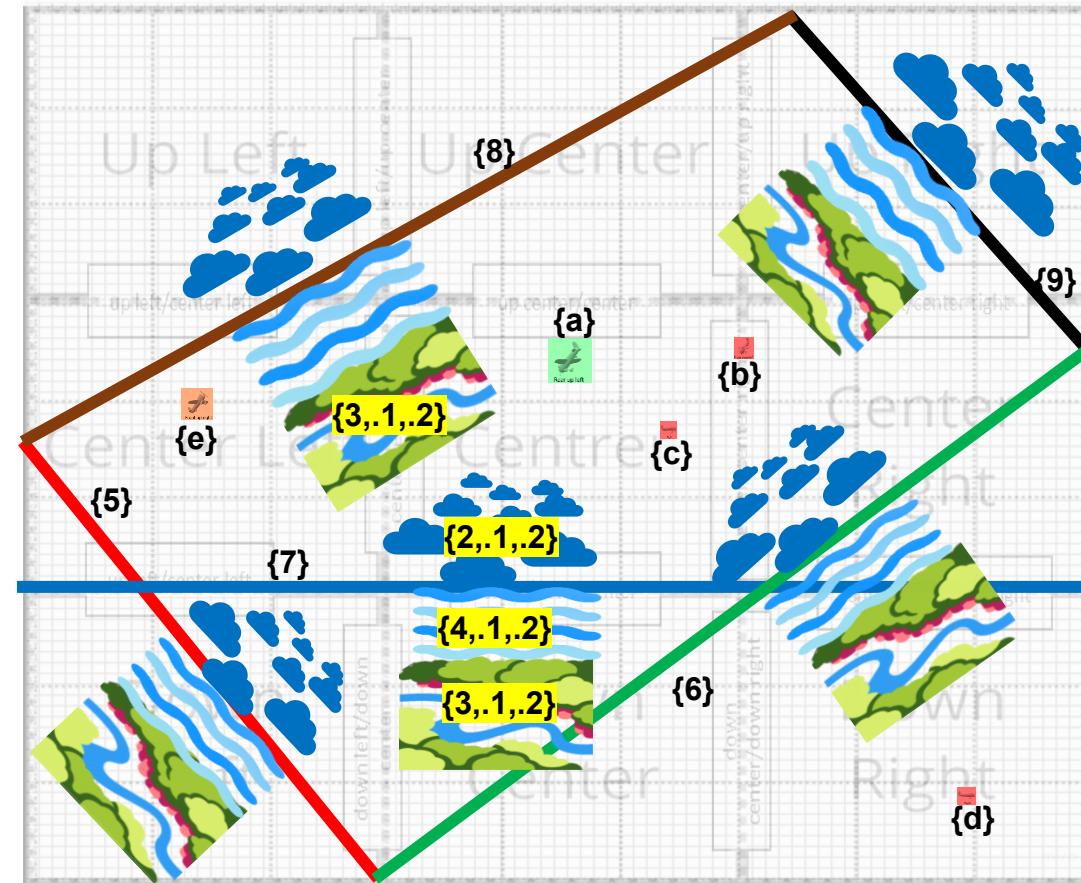


AI Training CuneiForm 3

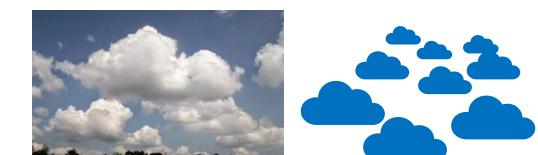
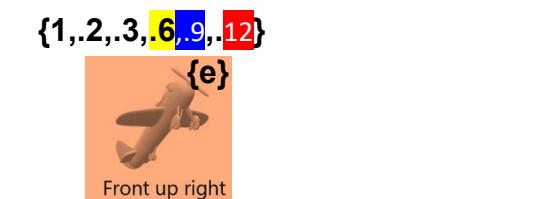
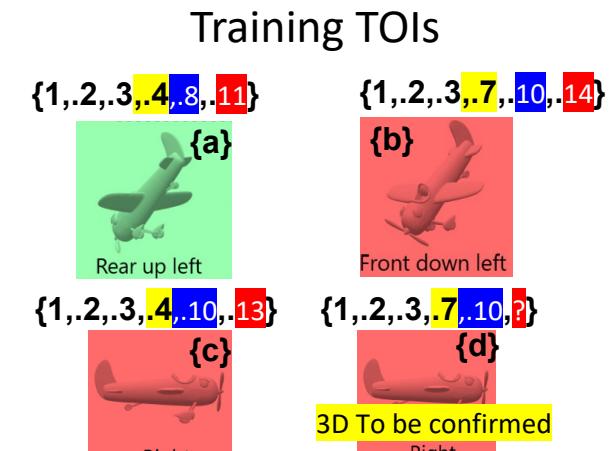


Abstract CuneiForm Characteristics (dimensions)	Abstract CuneiForm Characteristics definitions
TOIs definition and their aesthetic complexity	Single-engine propeller aeroplane {1}
TOI Motion and Dynamic optical states	Motion trajectory: Linear motion captured in consecutive images where the aeroplane appears to move in a straight line at a constant speed (no acceleration) {1.2}. Dynamic optical state: captured without optical blur {1.3}.
Background Objects associated with TOIs	Broken Clouds{2} green-terrain {3} water surface{4}
Background Objects Motion and Dynamic optical states	Background objects' motion trajectory is static {2.1,3.1,4.1} Dynamic optical state: no motion blur{2.2,3.2,4.2}
Visible horizon attitude	Negatively Tilted Lowered Horizon{5} Positively Tilted Lowered Horizon{6} Lowered Level Horizon{7} Negatively Tilted Elevated Horizon{8} Positively Tilted Elevated Horizon{9}
TOI's Pictorial Positioning	Center{1.4} Down right{1.5} center left{1.6} center/center right{1.7}
TOI's Pictorial Distance	recognisable TOI distance{1.8}, moderately recognisable TOI distance{1.9}, extremely unrecognisable TOI distance{1.10},
TOI's 3D Orientation	Rear up left{1.11} front up right{1.12} Right{1.13} front down left{1.14}

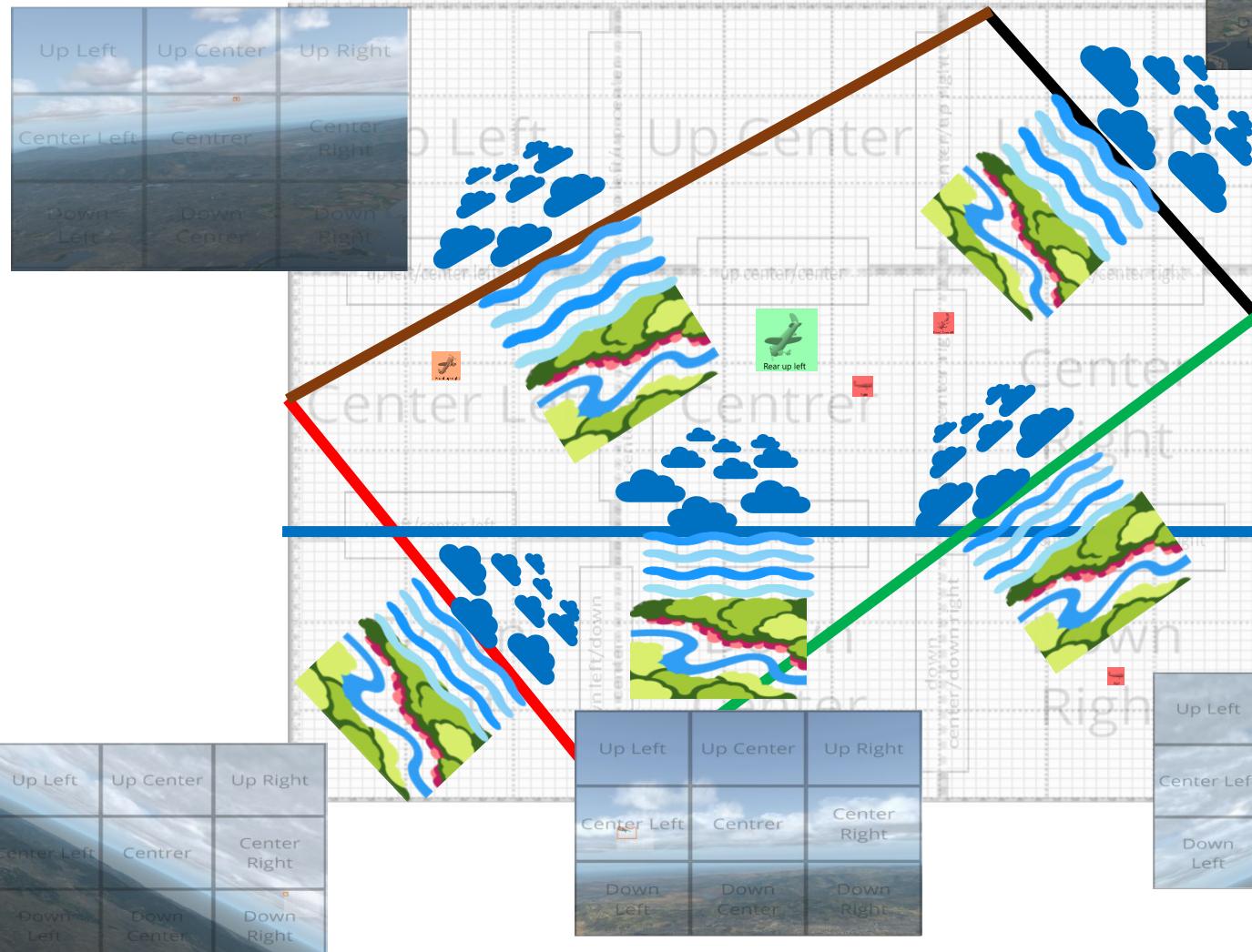
AI Training CuneiForm 3



Time of Day	Early Morning (Dawn){10}, Mid-Morning{11}, Night{12}
Instantiated Image	cessna_ac_training30 cessna_ac_training31 cessna_ac_training32 cessna_ac_training33 cessna_ac_training34



AI Training CuneiForm 3

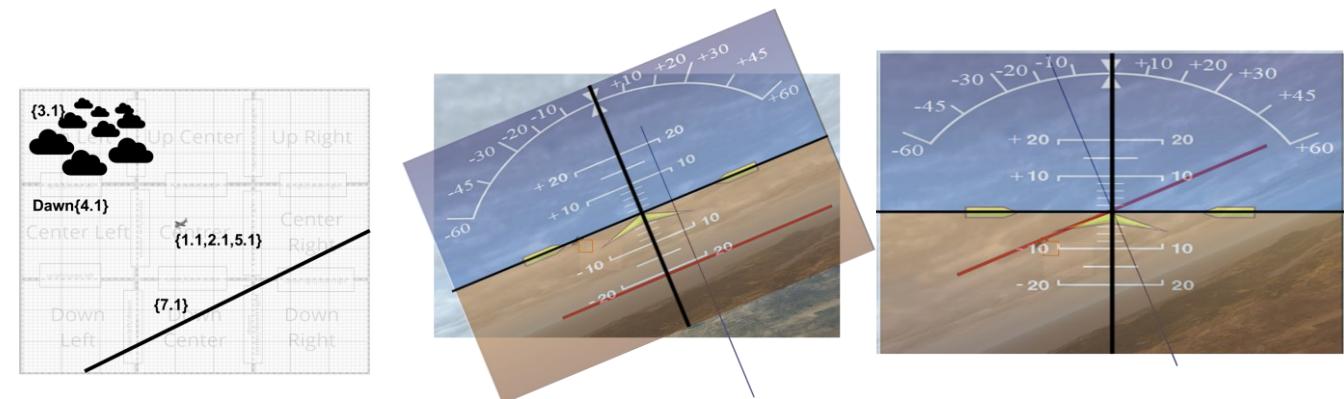


This instantiation
looks more like
scattered clouds
than broken

This instantiation
looks more like
scattered clouds
than broken

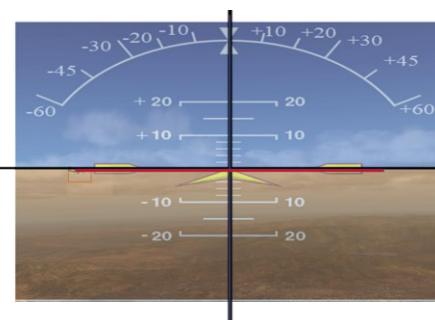
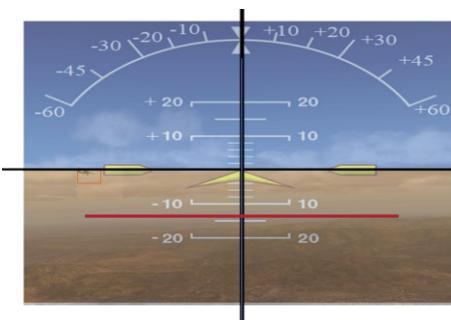
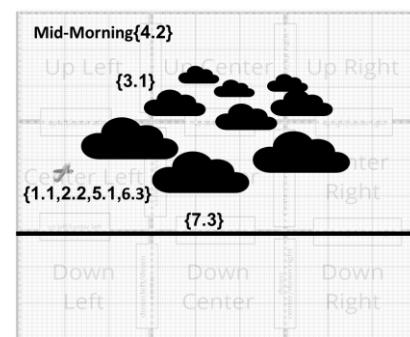
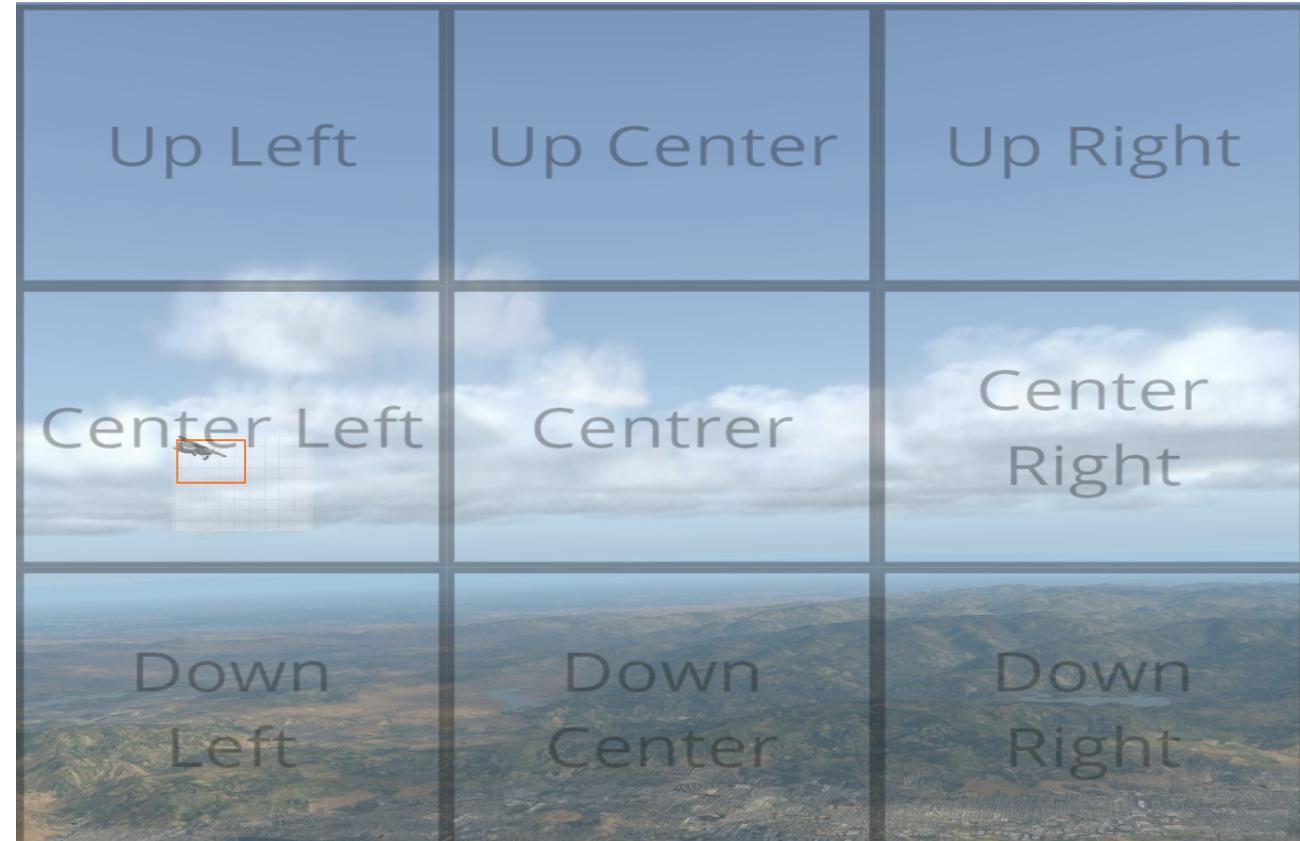
30.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	Early Morning (Dawn), 05:26:23
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/9 = 729$
TOI's Pictorial positioning	center
TOI's 3D orientation	rear up left
Horizon attitude	Roll: -15, Pitch: -20



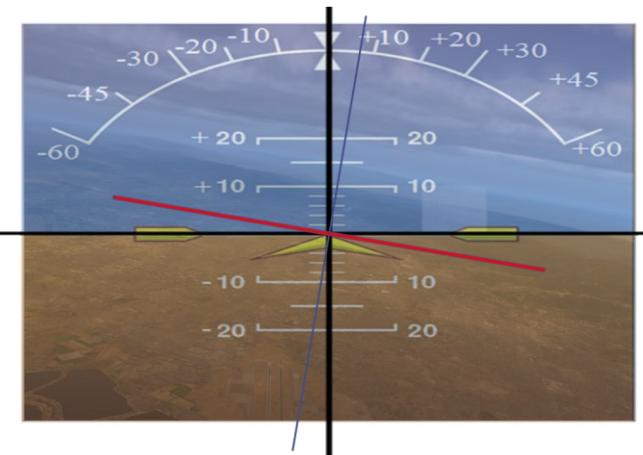
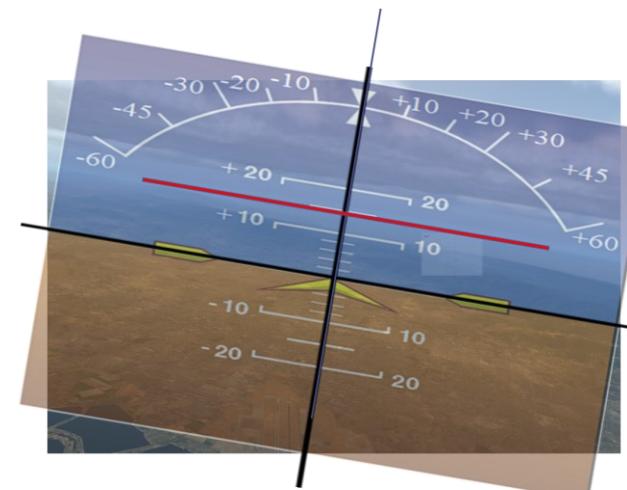
31.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	Mid-Morning, 10:20:18
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/8 = 820.125$
TOI's Pictorial positioning	center left
TOI's 3D orientation	front up right
Horizon attitude	Roll: 0, Pitch: -14



32.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	night, 03:40:13
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/2 = 3280.5$
TOI's Pictorial positioning	center/center right
TOI's 3D orientation	front down left
Horizon attitude	Roll: 7, Pitch: 15

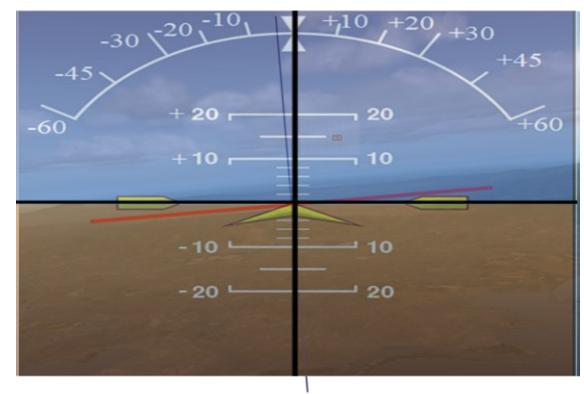
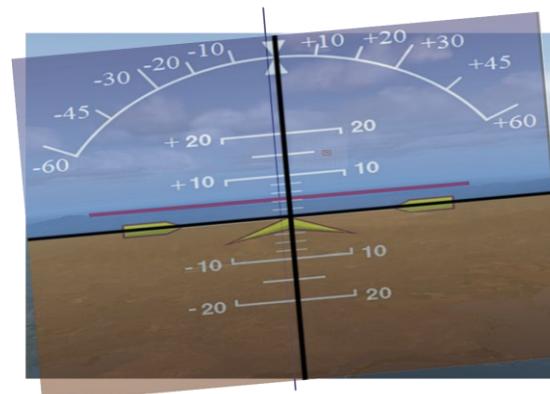


33.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	Night, 23:26:59
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	center
TOI's 3D orientation	right
Horizon attitude	Roll: -3, Pitch: 4

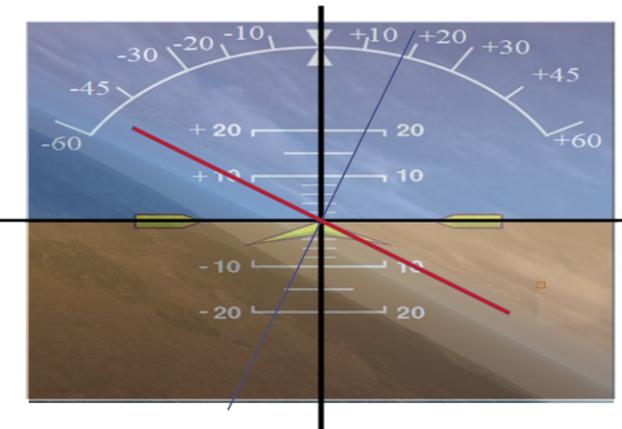
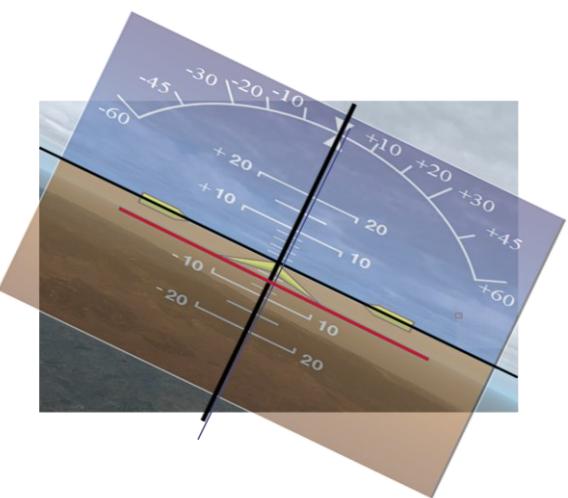
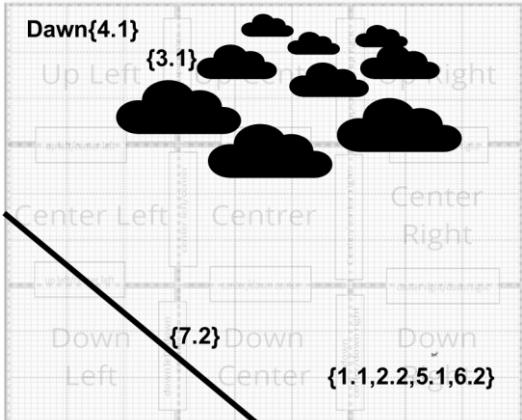


Right

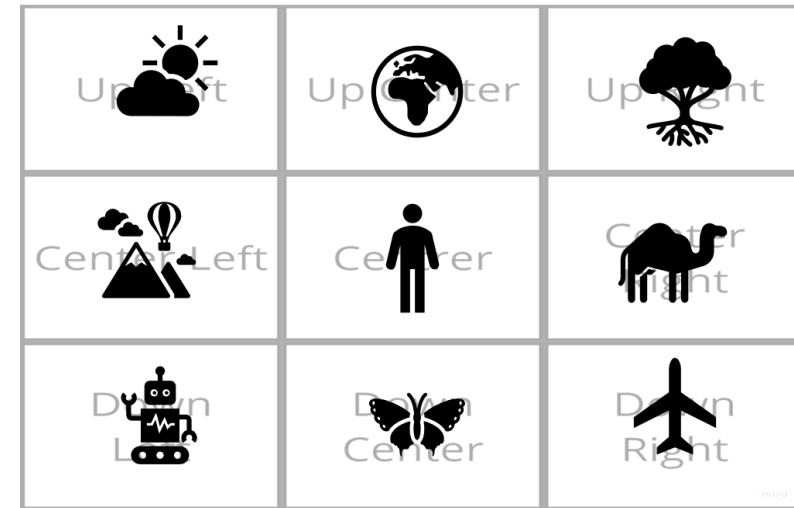


34.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	Early Morning (Dawn), 04:03:13
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	down right
TOI's 3D orientation	Unknown
Horizon attitude	Roll: 18, Pitch: -6

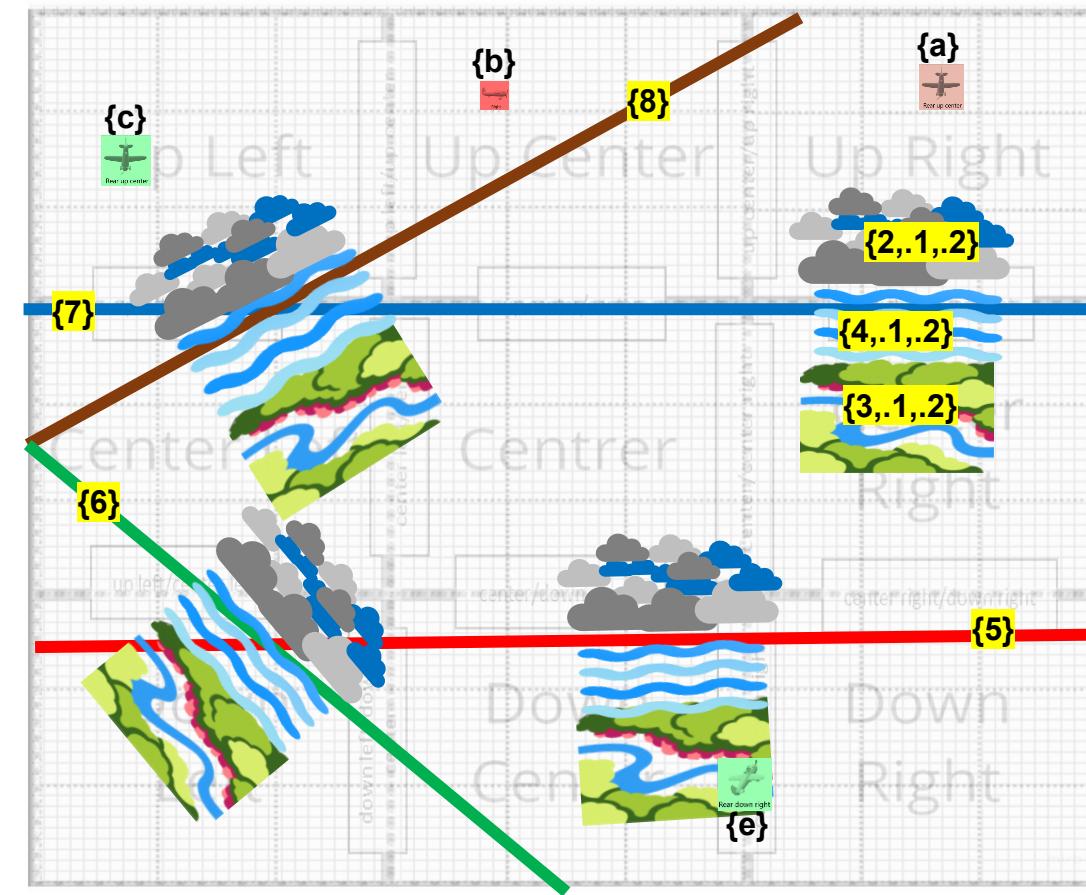


AI Training CuneiForm 4

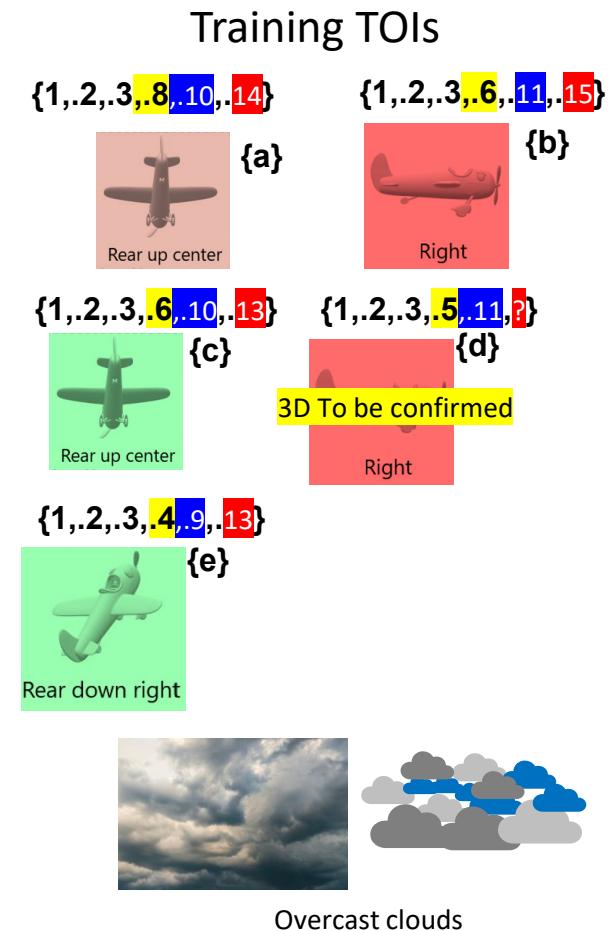


Abstract CuneiForm Characteristics (dimensions)	Abstract CuneiForm Characteristics definitions
TOIs definition and their aesthetic complexity	Single-engine propeller aeroplane {1}
TOI Motion and Dynamic optical states	Motion trajectory: Linear motion captured in consecutive images where the aeroplane appears to move in a straight line at a constant speed (no acceleration) {1.2}. Dynamic optical state: captured without optical blur {1.3}.
Background Objects associated with TOIs	Overcast Clouds{2} green-terrain {3} water surface{4}
Background Objects Motion and Dynamic optical states	Background objects' motion trajectory is static {2.1,3.1,4.1} Dynamic optical state: no motion blur{2.2,3.2,4.2}
Visible horizon attitude	Lowered Level Horizon{5} Positively Tilted Lowered Horizon{6} Elevated Level Horizon{7} Negatively Tilted Elevated Horizon{8}
TOI's Pictorial Positioning	down center/down right{1.4} Down right{1.5} up center{1.6} Up left{1.7} up right{1.8}
TOI's Pictorial Distance	recognisable TOI distance{1.9}, moderately recognisable TOI distance{1.10}, extremely unrecognisable TOI distance{1.11},
TOI's 3D Orientation	Unknown{1.12} rear down right{1.13} rear up center{1.14} right{1.15}

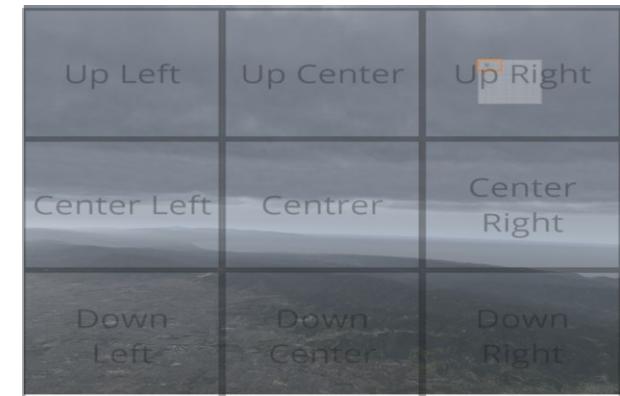
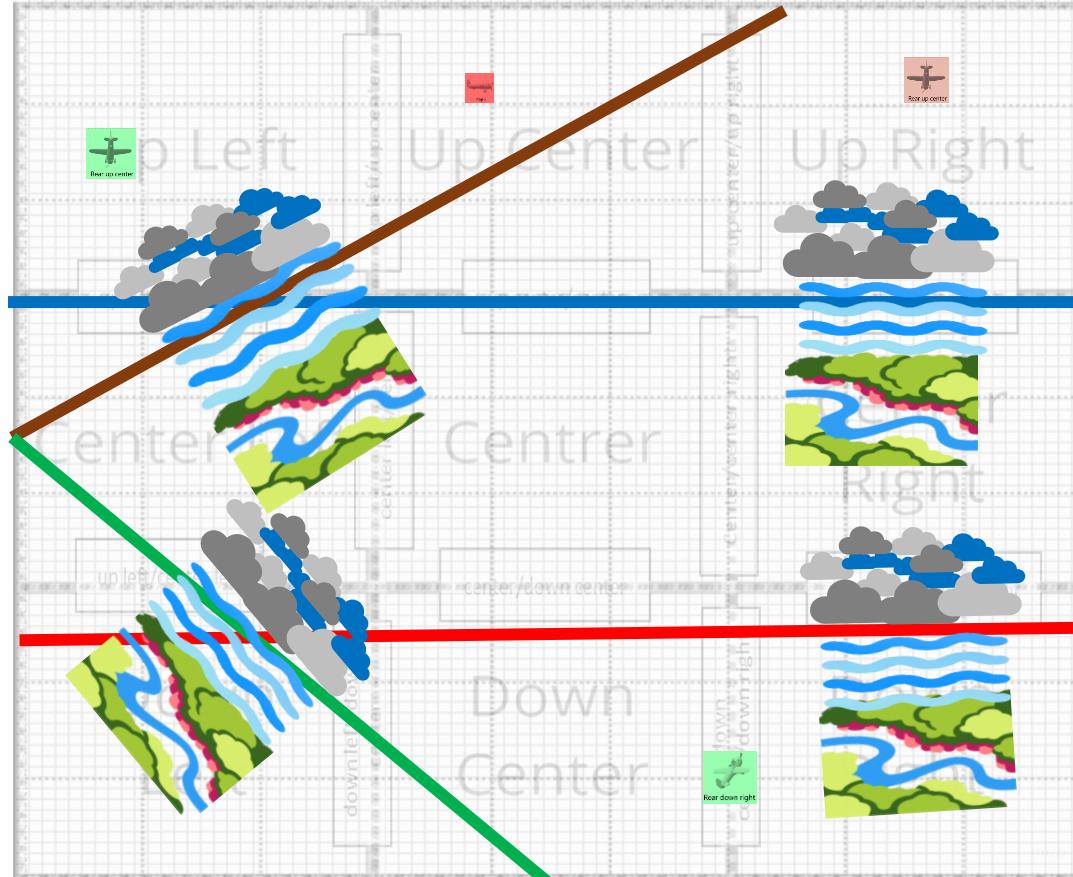
AI Training CuneiForm 4



Time of Day	Early Morning (Dawn){10}, Mid-Morning{11}, Night{12}
Instantiated Image	cessna_ac_training40 cessna_ac_training41 cessna_ac_training42 cessna_ac_training43 cessna_ac_training44



AI Training CuneiForm 4

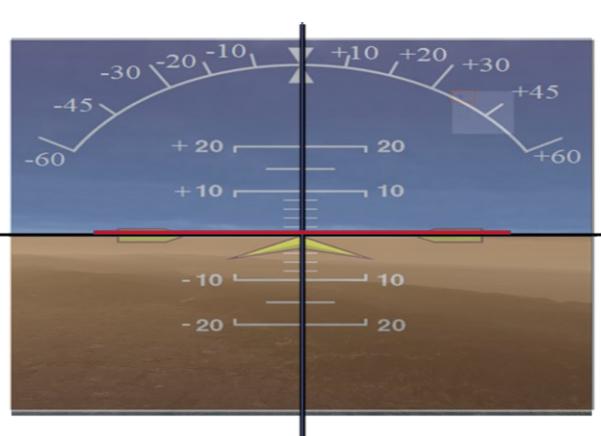
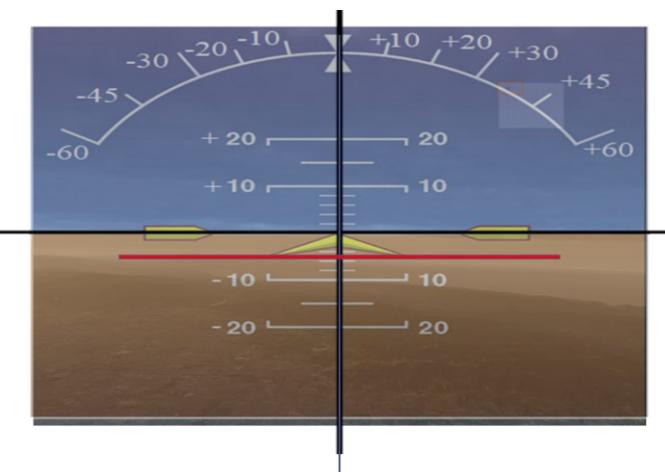
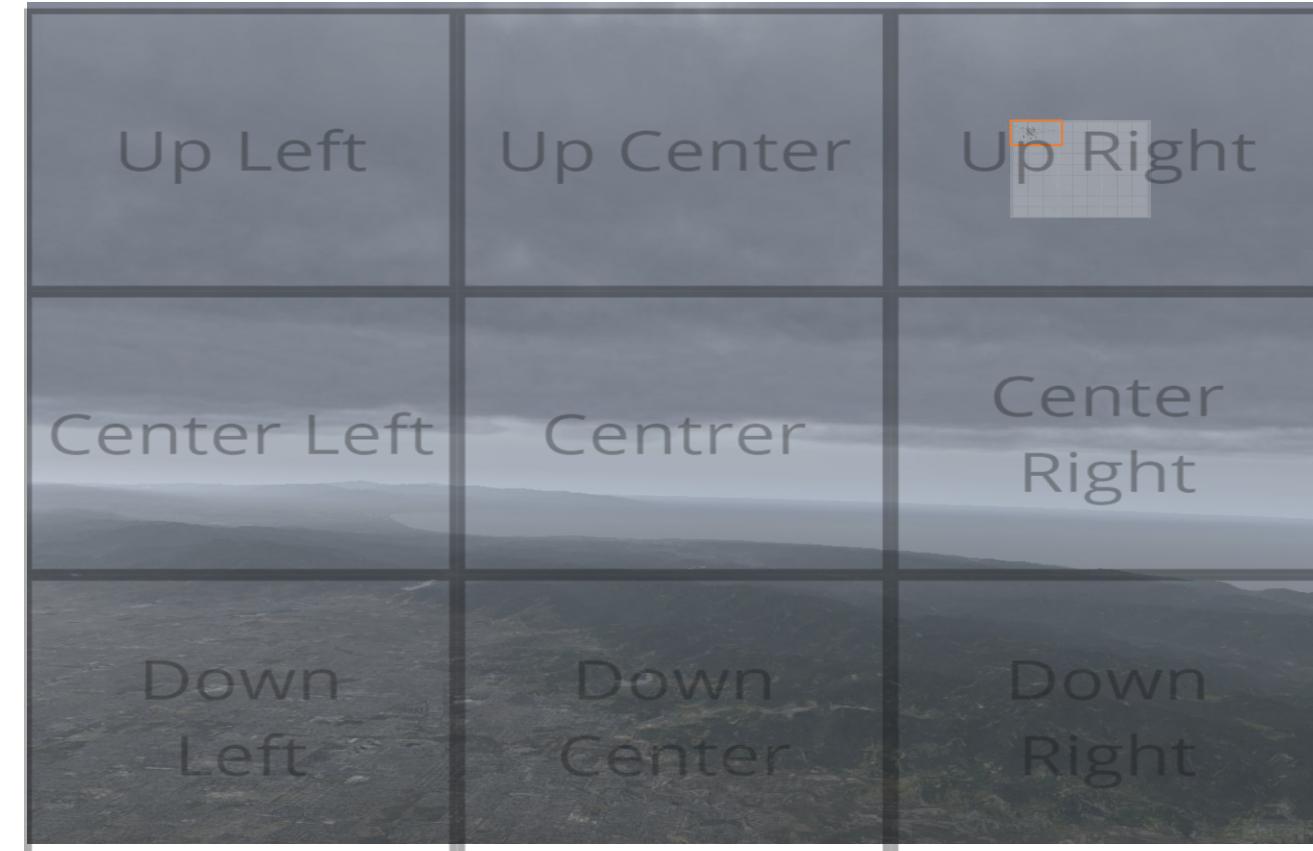


40.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast,
Time of Day	morning, 03:52:05
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/8
TOI's Pictorial positioning	up right
TOI's 3D orientation	rear up center
Horizon attitude	Roll: 0, Pitch: -6

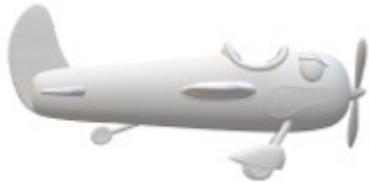


Rear up center

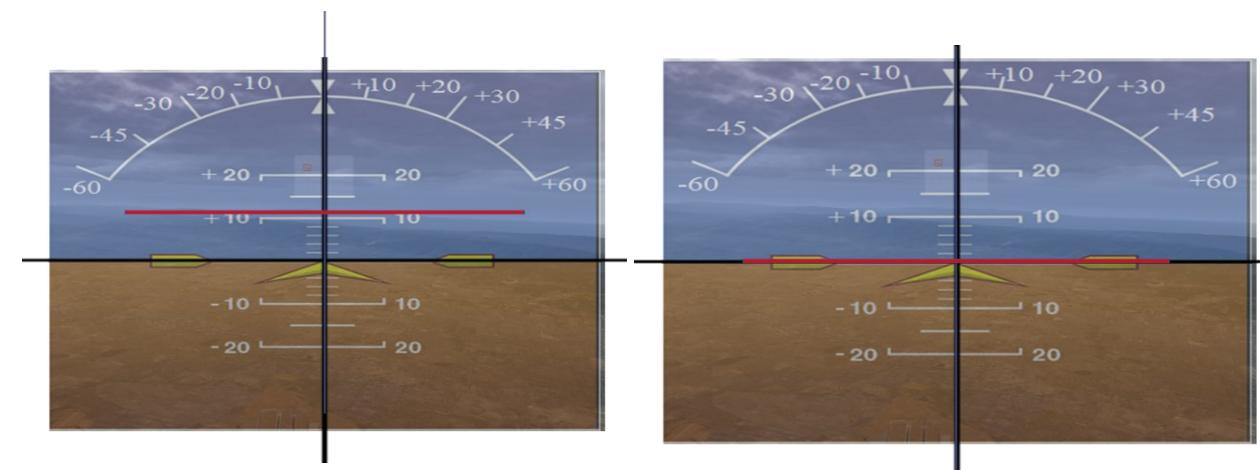


41.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast,
Time of Day	midday, 12:19:34
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	up center
TOI's 3D orientation	right
Horizon attitude	Roll: 0, Pitch: 11



Right

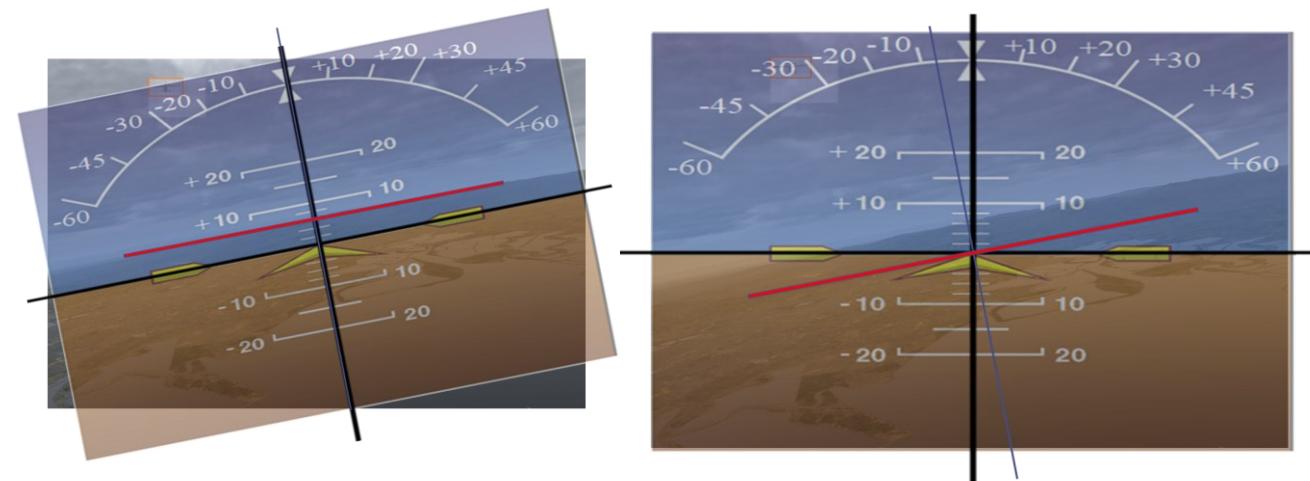
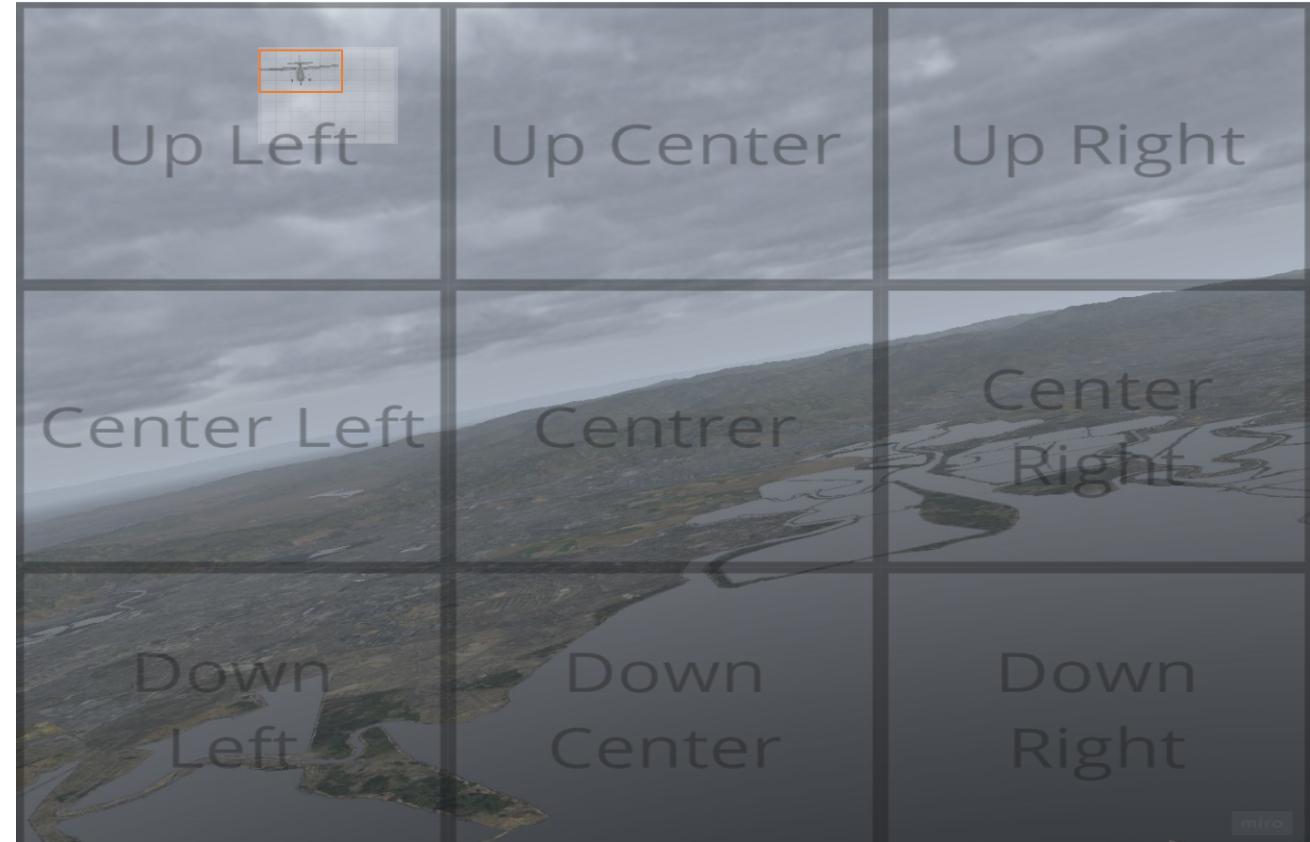


42.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast
Time of Day	midday, 12:58:14
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/16 = 410$
TOI's Pictorial positioning	Up left
TOI's 3D orientation	Rear up center
Horizon attitude	Roll: -8, Pitch: 6

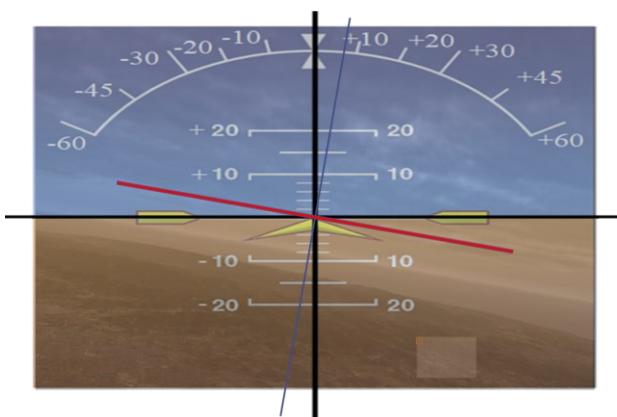
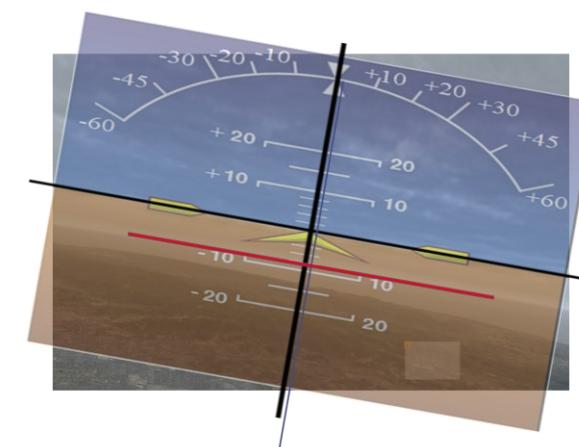


Rear up center



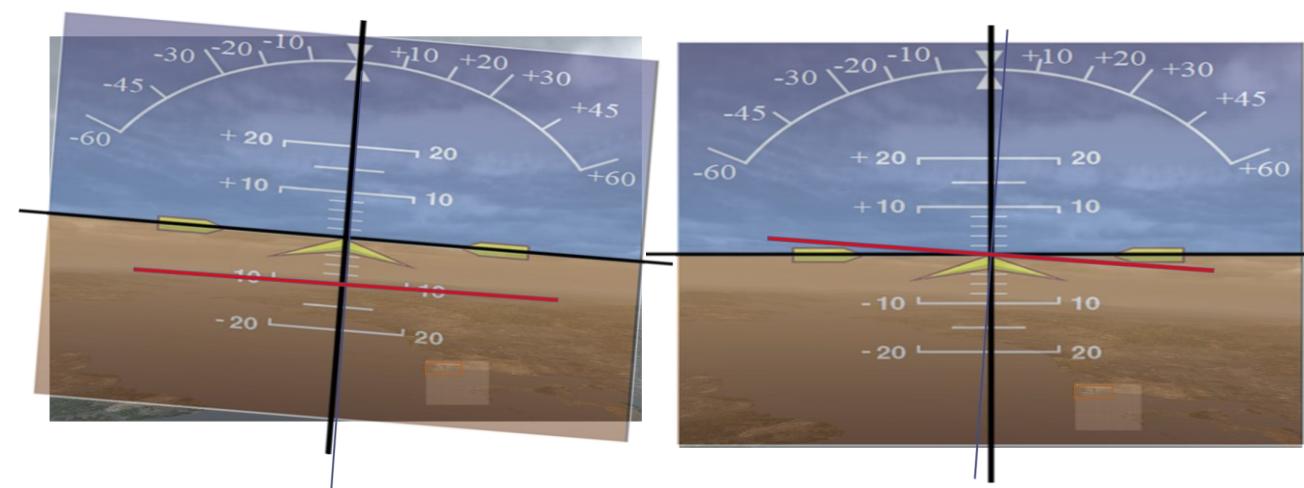
43.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast,
Time of Day	morning, 10:36:00
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	down right
TOI's 3D orientation	Unknown
Horizon attitude	Roll: 8, Pitch: -9

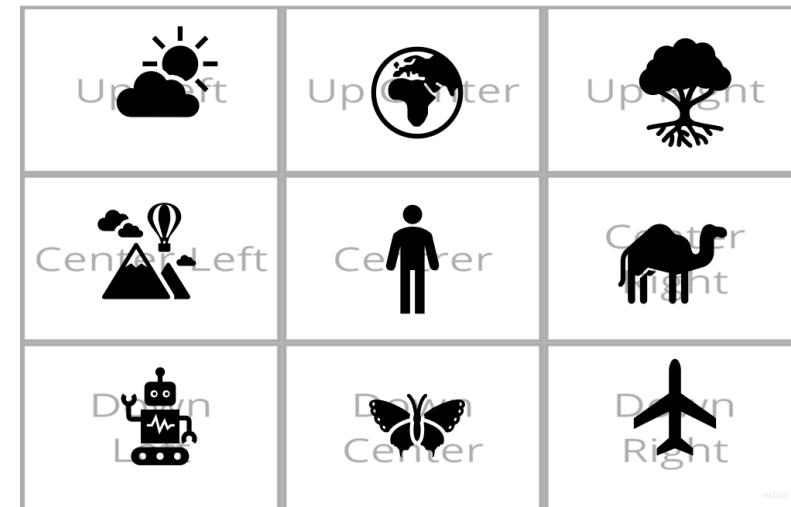


44.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast
Time of Day	morning, 17:59:44
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/10 = 656.1$
TOI's Pictorial positioning	down center/down right
TOI's 3D orientation	rear down right
Horizon attitude	Roll: 2, Pitch: -10

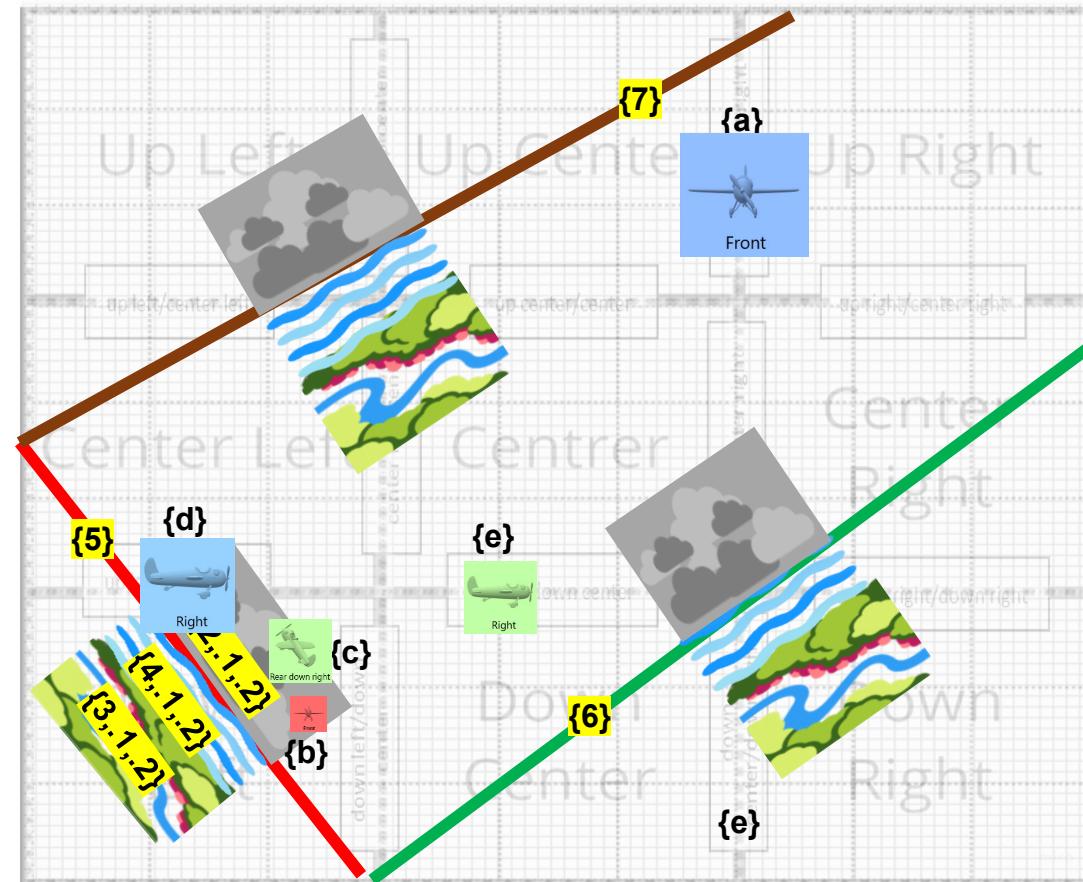


AI Training CuneiForm 5



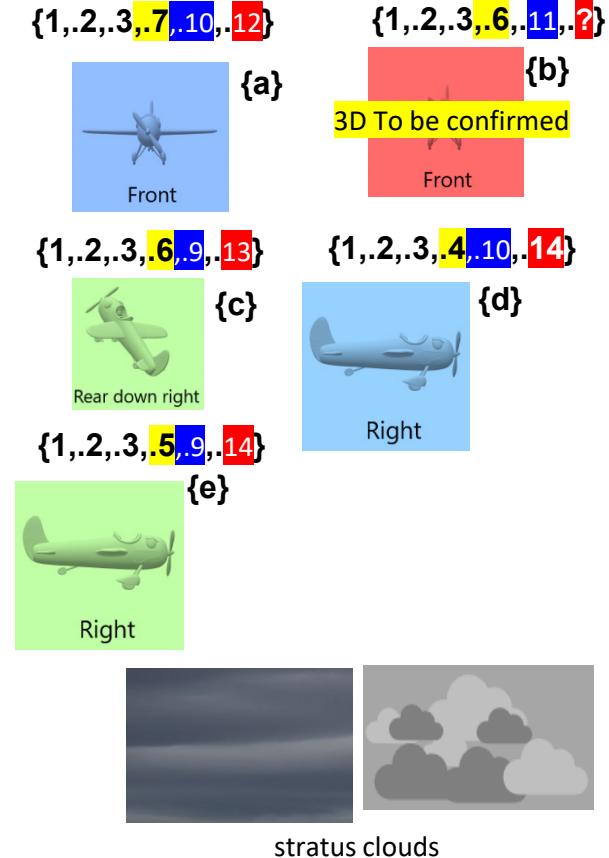
Abstract CuneiForm Characteristics (dimensions)	Abstract CuneiForm Characteristics definitions
TOIs definition and their aesthetic complexity	Single-engine propeller aeroplane {1}
TOI Motion and Dynamic optical states	Motion trajectory: Linear motion captured in consecutive images where the aeroplane appears to move in a straight line at a constant speed (no acceleration) {1.2}. Dynamic optical state: captured without optical blur {1.3}.
Background Objects associated with TOIs	Stratus Clouds{2} green-terrain {3} water surface{4}
Background Objects Motion and Dynamic optical states	Background objects' motion trajectory is static {2.1,3.1,4.1} Dynamic optical state: no motion blur{2.2,3.2,4.2}
Visible horizon attitude	Negatively Tilted Lowered Horizon{5} Positively Tilted Lowered Horizon{6} Negatively Tilted Elevated Horizon{7}
TOI's Pictorial Positioning	center left/down left{1.4} center/down center{1.5} down left{1.6} up center/up right{1.7}
TOI's Pictorial Distance	recognisable TOI distance{1.9}, clear close TOI distance{1.10}, extremely unrecognisable TOI distance{1.11},
TOI's 3D Orientation	Front{1.12} rear down right{1.13} Right{1.14} Unknown{1.15}

AI Training CuneiForm 5



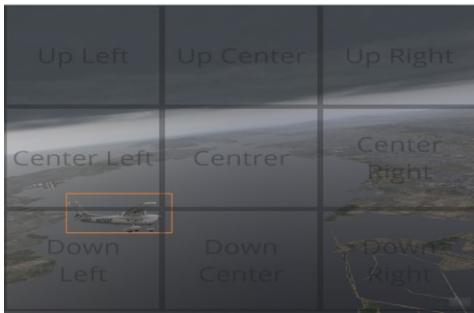
Time of Day	Early Morning (Dawn){10}, Mid-Morning{11}, Night{12}
Instantiated Image	cessna_ac_training50 cessna_ac_training51 cessna_ac_training52 cessna_ac_training53 cessna_ac_training54

Training TOIs



AI Training CuneiForm 5

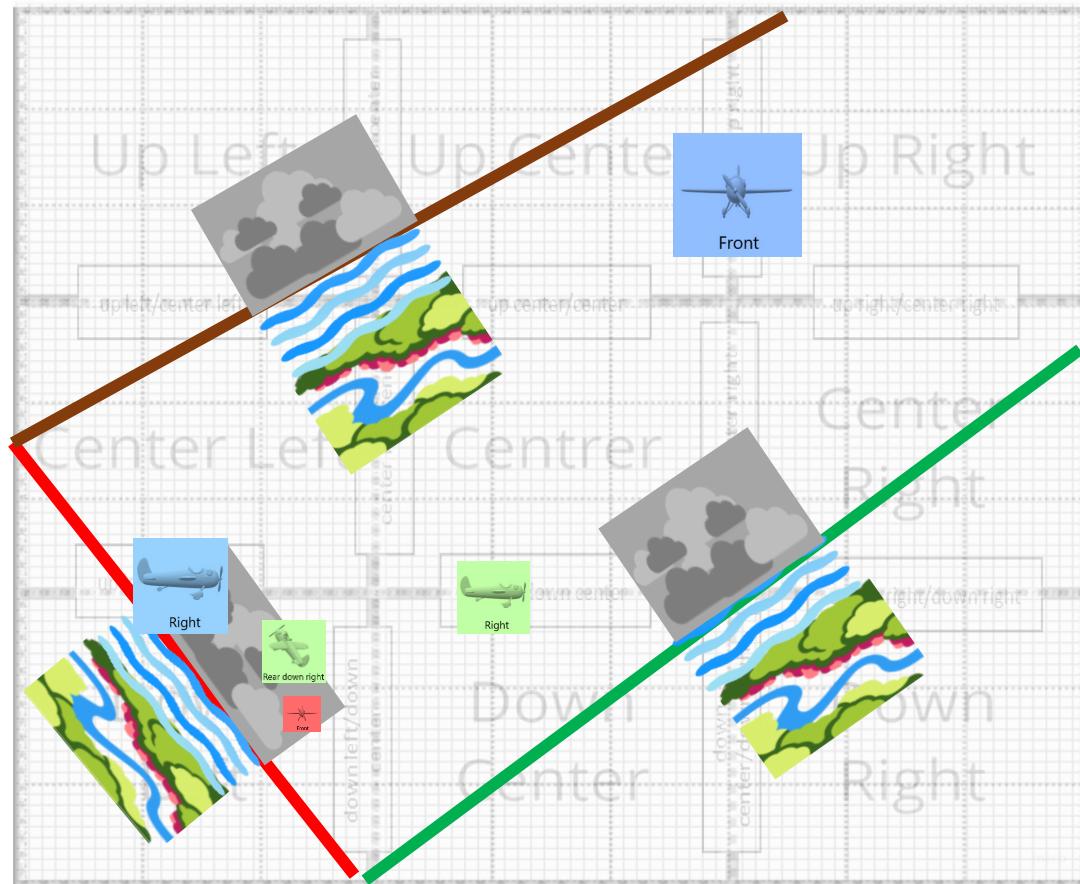
53.jpg



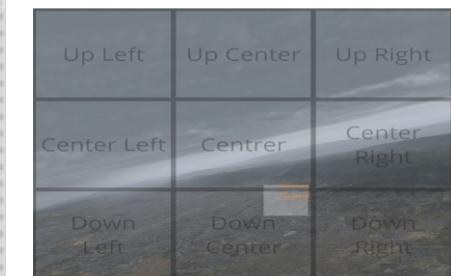
52.jpg



51.jpg



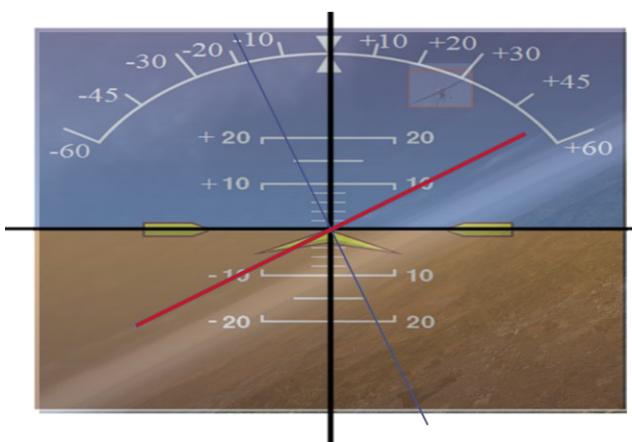
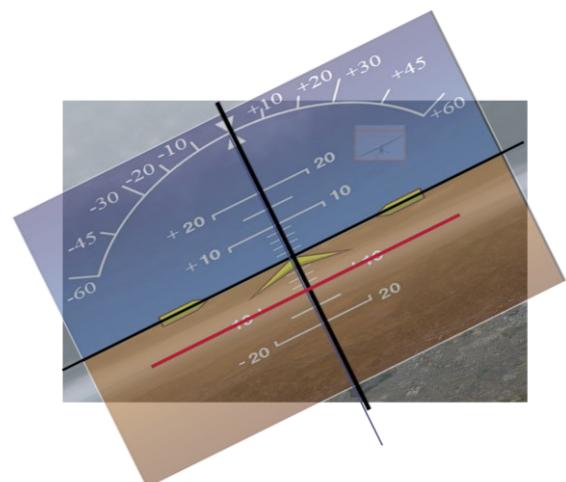
50.jpg



54.jpg

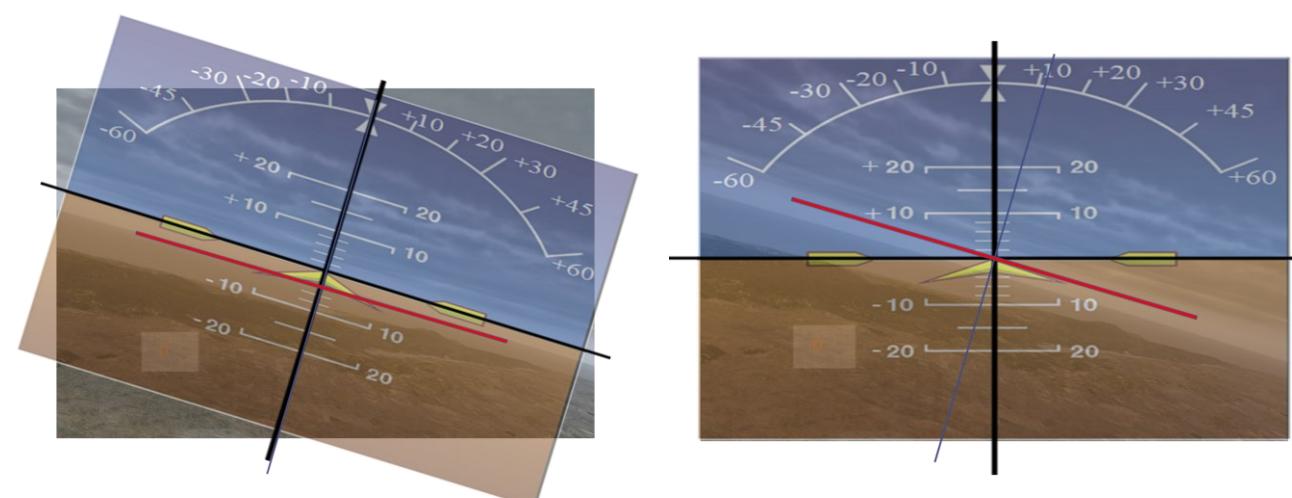
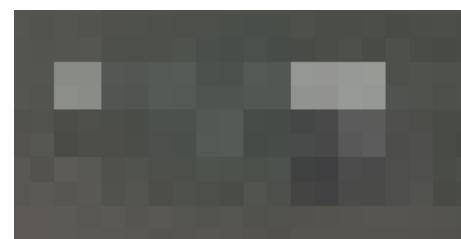
50.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	Mid-Morning, 10:07:30
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/72 = 91.1$
TOI's Pictorial positioning	up center/up right
TOI's 3D orientation	Front
Horizon attitude	Roll: -18, Pitch: -10



51.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	late afternoon, 20:50:56
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	down left
TOI's 3D orientation	unknown
Horizon attitude	Roll: 12, Pitch: -4

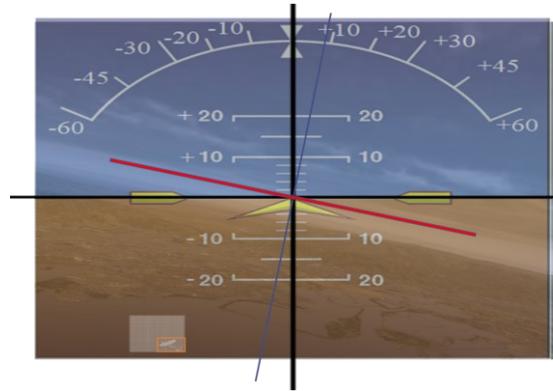
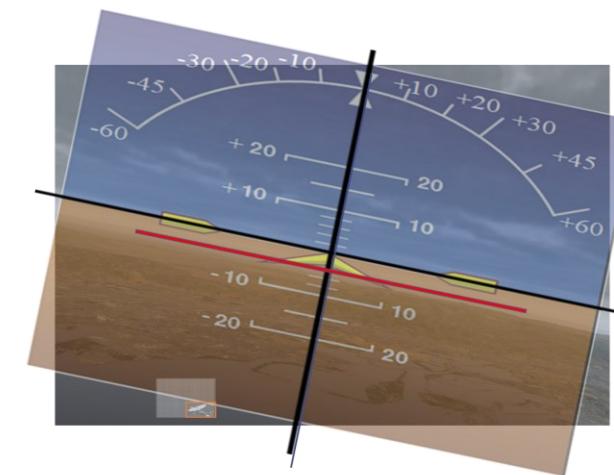
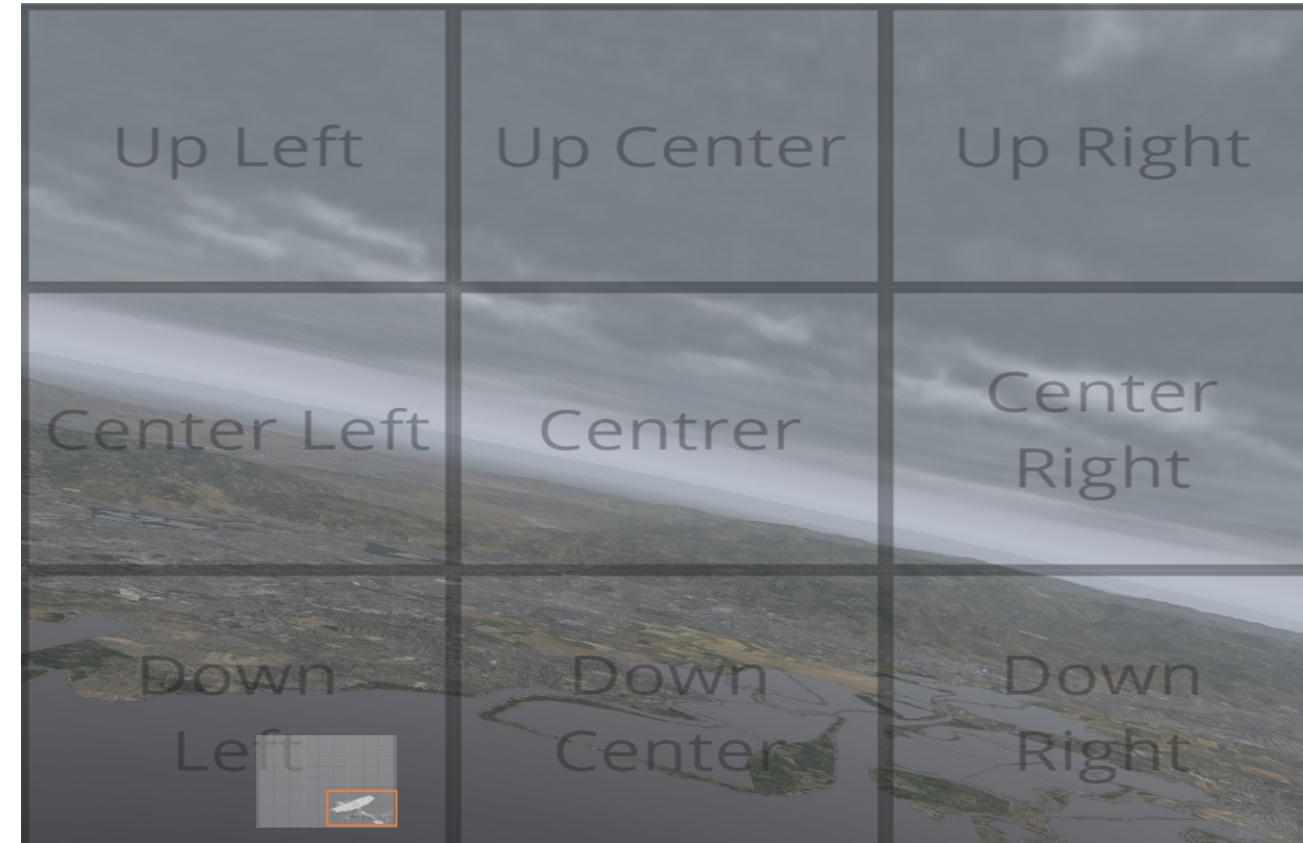


52.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	morning, 06:10:03
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/12 = 546.75$
TOI's Pictorial positioning	down left
TOI's 3D orientation	rear down right
Horizon attitude	Roll: 8, Pitch: -4



Rear down right

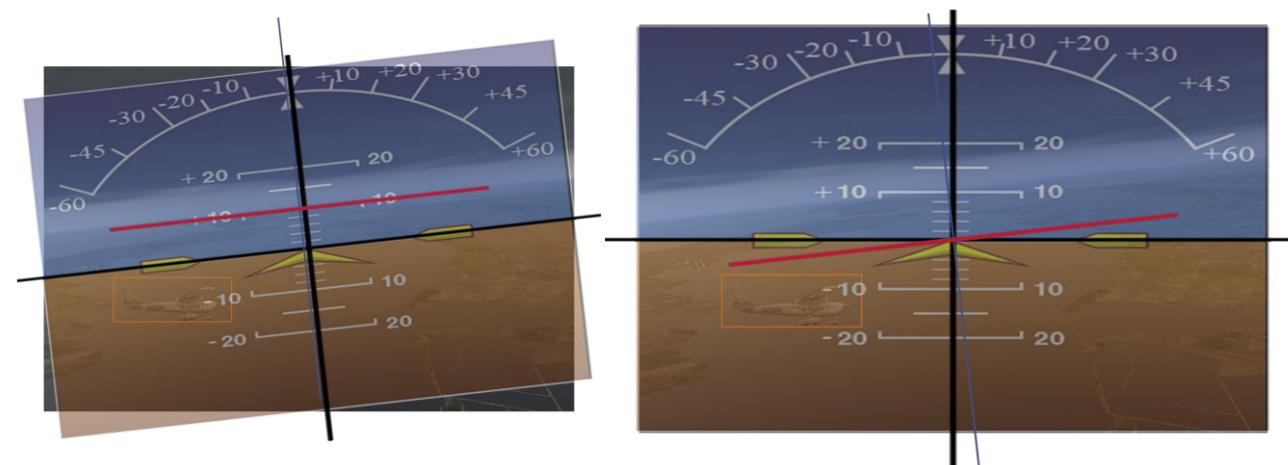


53.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	morning
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/162 = 40.5$
TOI's Pictorial positioning	center left/down left
TOI's 3D orientation	right
Horizon attitude	Roll: -3, Pitch: 10

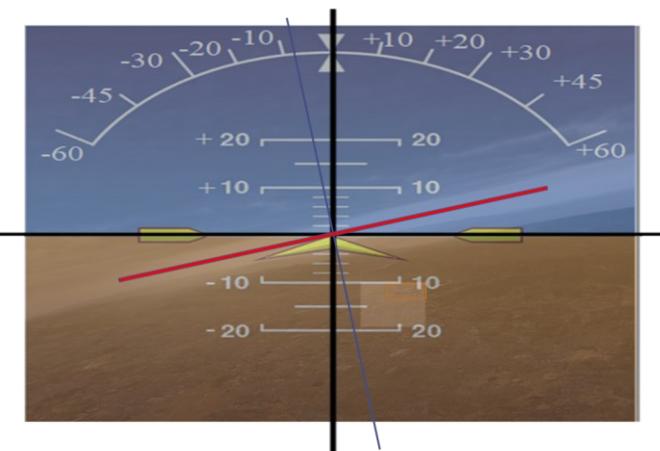
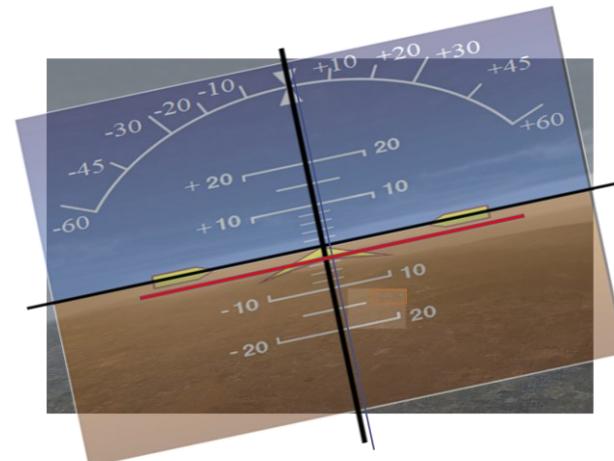


Right

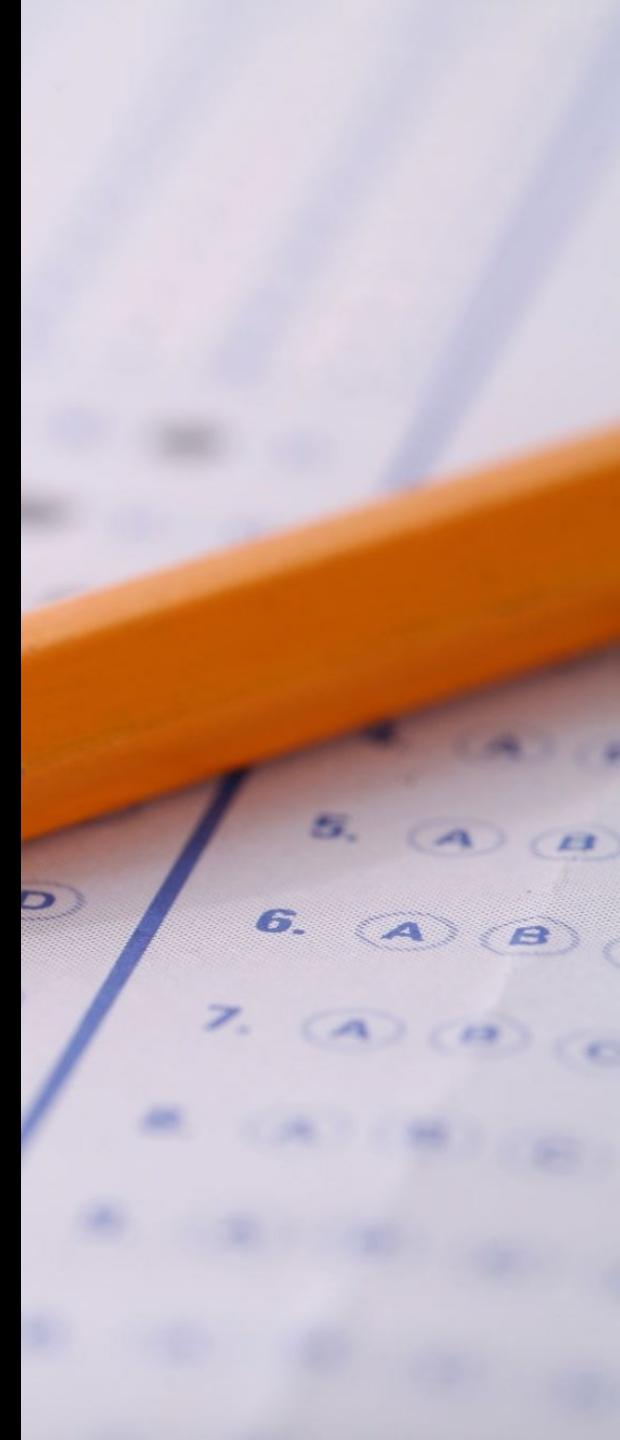


54.jpg

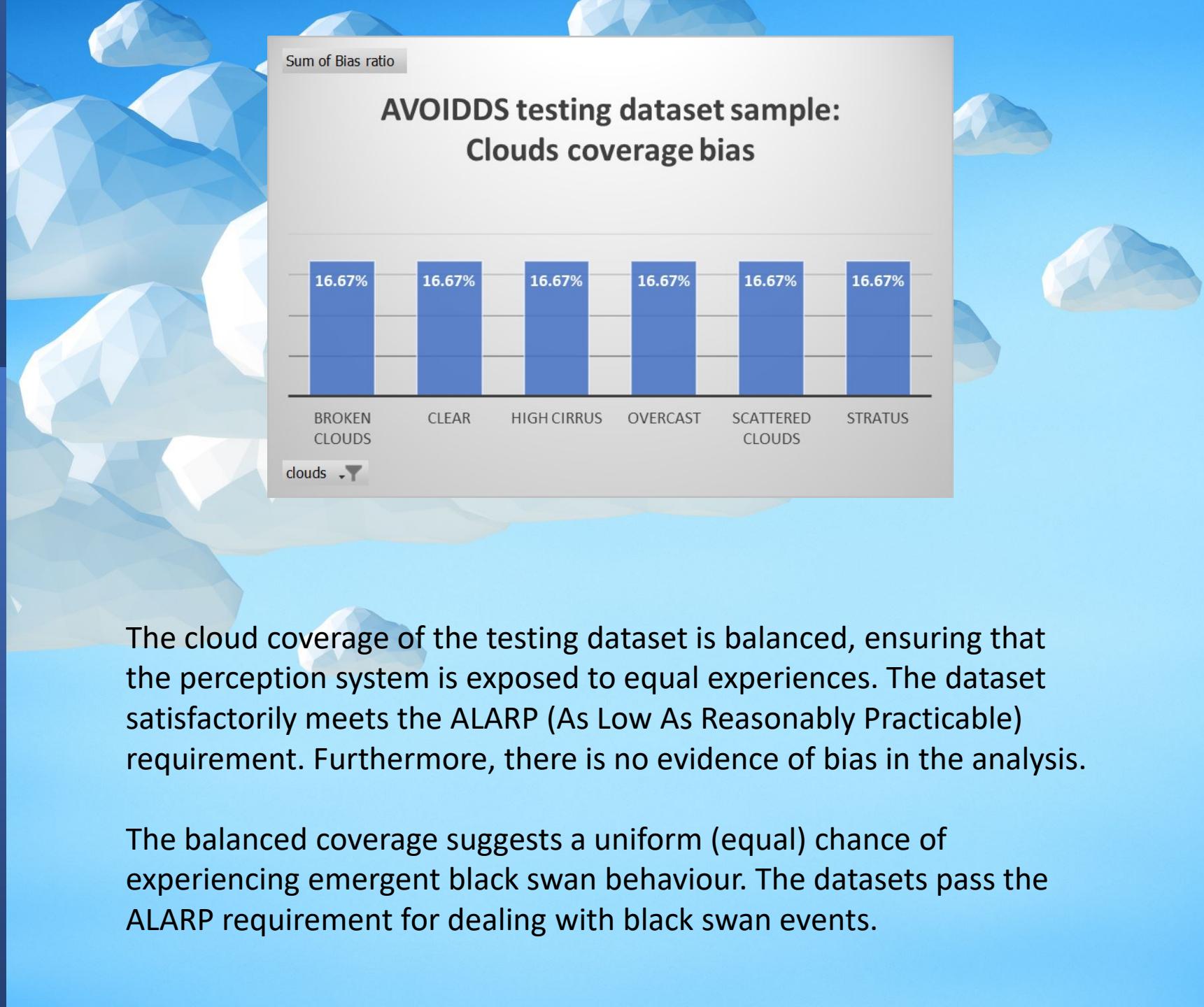
ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	midday, 12:10:28
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/15 = 437.4$
TOI's Pictorial positioning	center/down center
TOI's 3D orientation	right
Horizon attitude	Roll: -8, Pitch: -3



AVOIDDS
Testing dataset
sample



Examining AVOIDDS Testing Strategy in Covering Clouds type testing classes

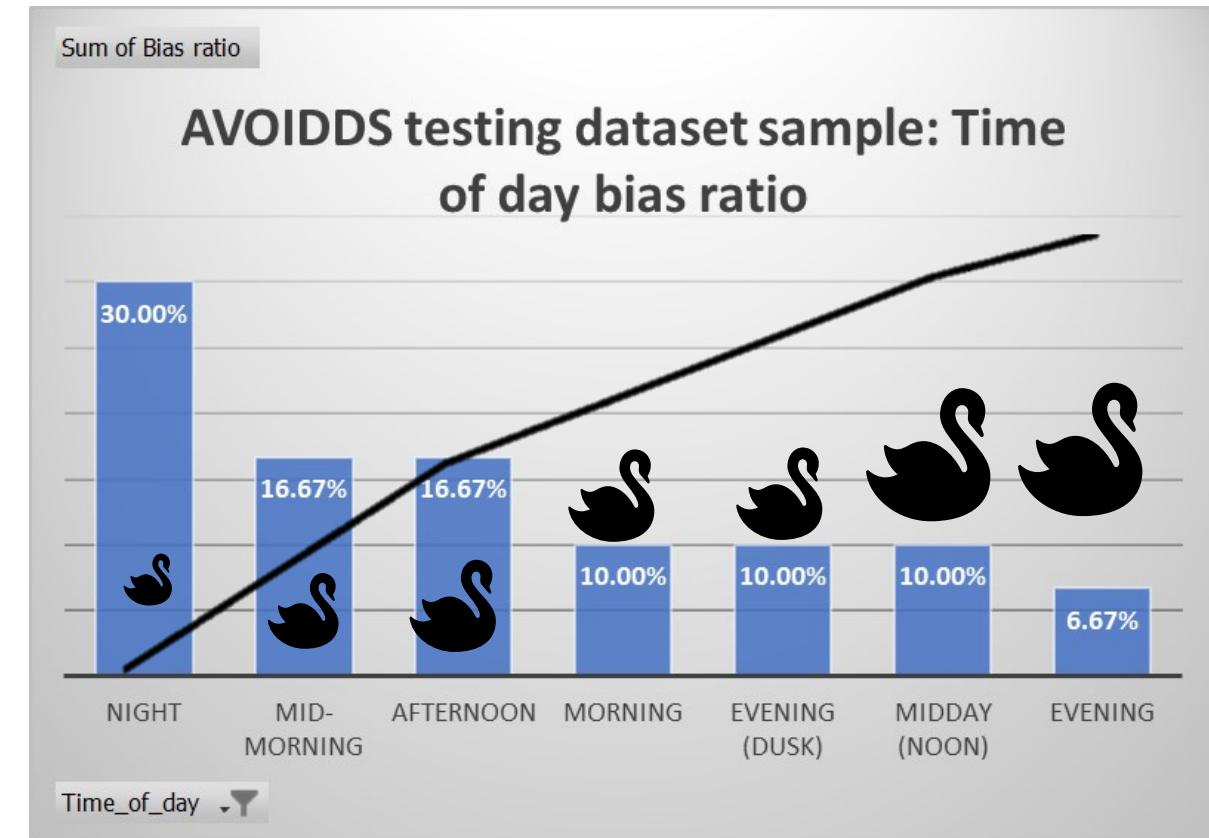


Examining AVOIDDS Testing Strategy in Covering Time of the Day testing classes

There exists an imbalance in coverage, with 47% of instances recorded at night or at mid-morning demonstrating strong bias.

The lack of balanced exposure constitutes a potential for an exponentially unpredictable high-risk emergent black swan behaviour performed by the perception. The dataset does not satisfactorily meet the ALARP requirement.

This dataset passes the ALARP criteria in terms of covering all possible time-of-the-day categories. Albeit, unbalanced coverage.



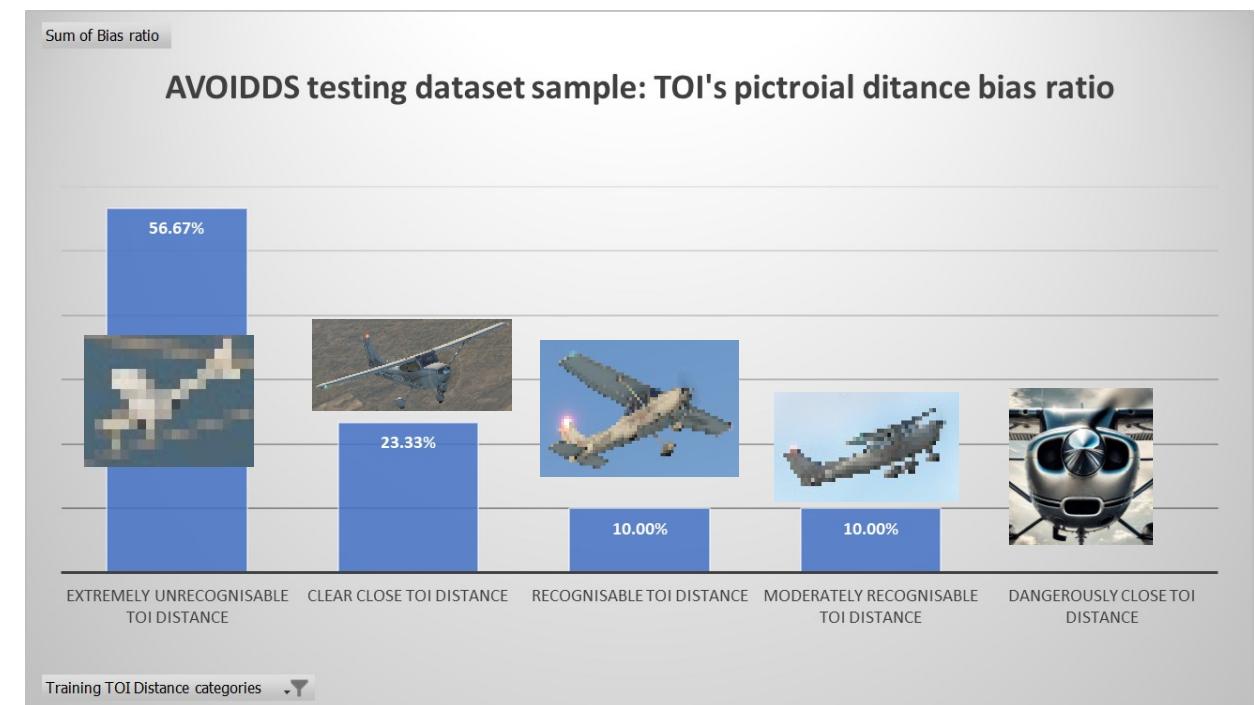
Examining AVOIDDS Testing Strategy in Covering Pictorial Distance testing classes

The dataset exhibits significant imbalance, with nearly 80% of test cases covering 20% of required categories. Categorised as occurring at “extremely unrecognizable distance” and “clear close distance”. Notably, there is a complete absence of instances classified as :

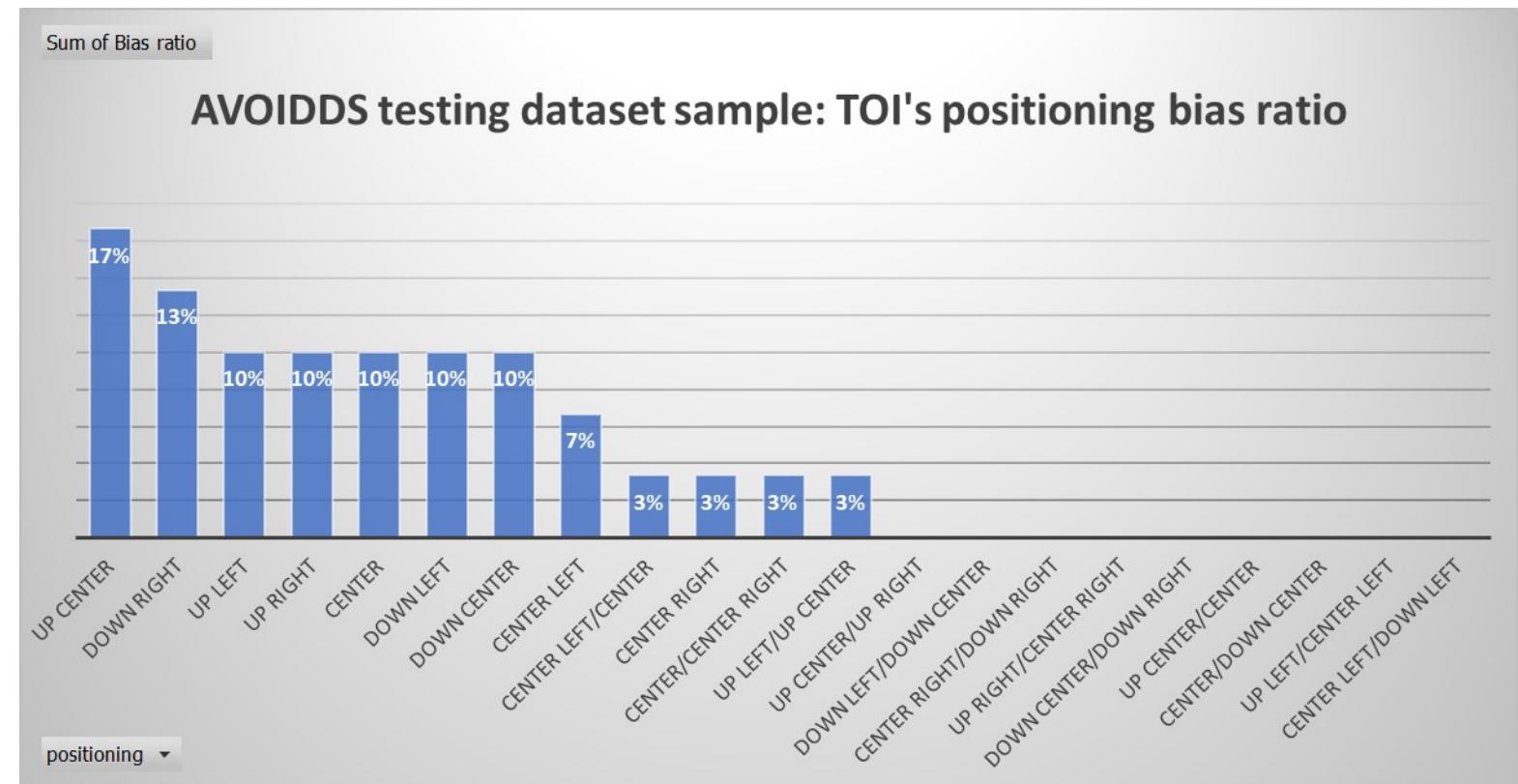
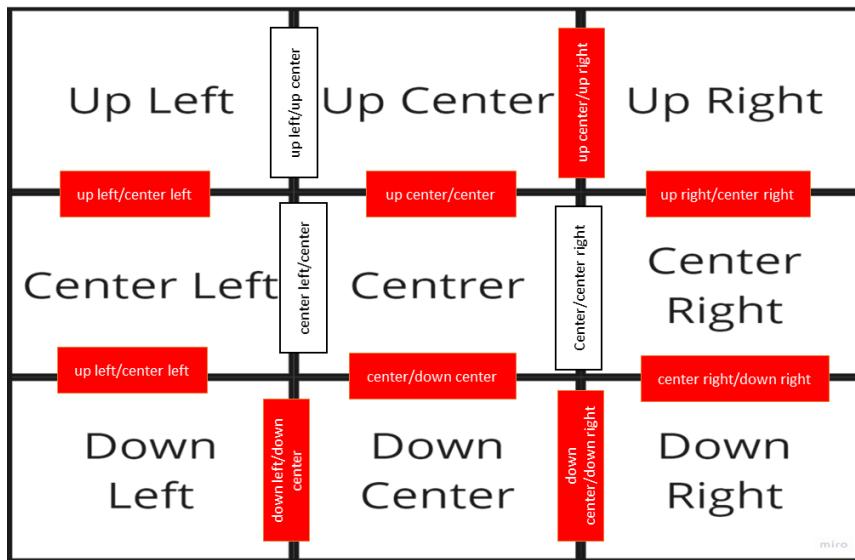
1. dangerously close distances

The lack of exposure constitutes a potential for an exponentially unpredictable high-risk emergent black swan behaviour performed by the perception.

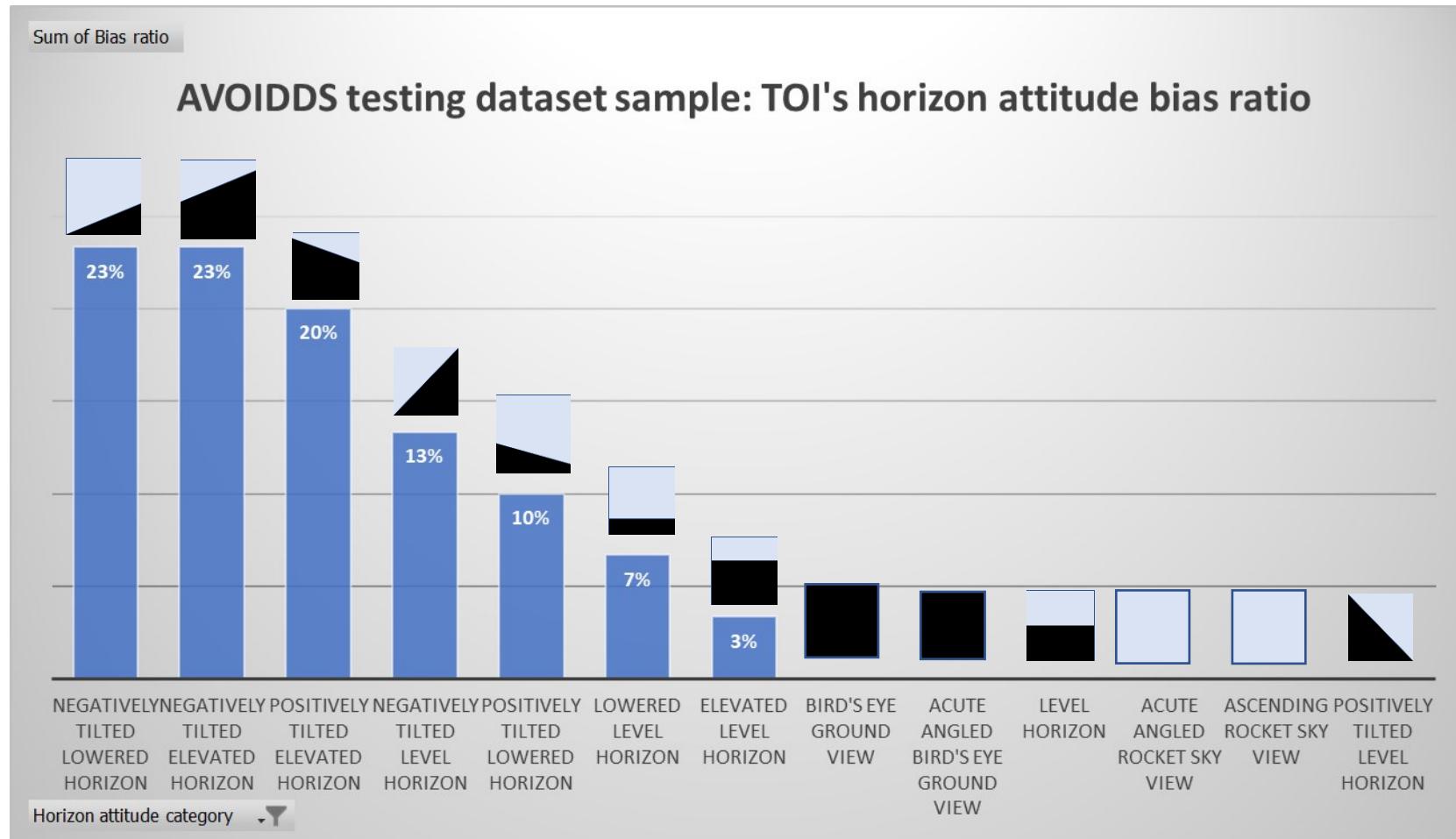
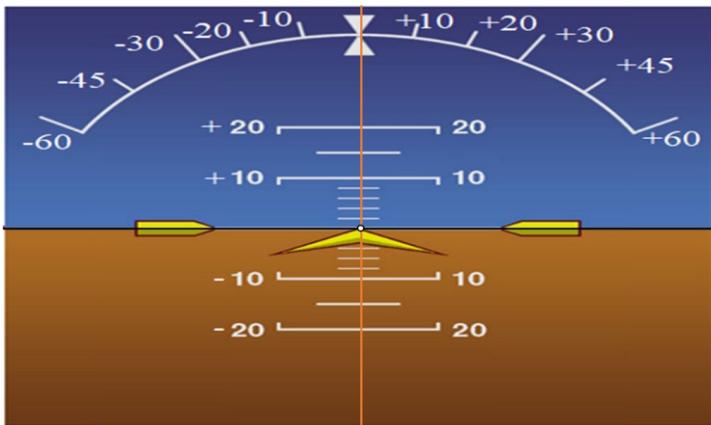
Consequently, the dataset does not satisfactorily fulfil the ALARP requirement for pictorial distance coverage.



Examining AVOIDDS Testing Strategy in Covering TOI's positioning testing classes



Examining AVOIDDS Testing Strategy in Covering Pictorial Horizon attitude testing classes

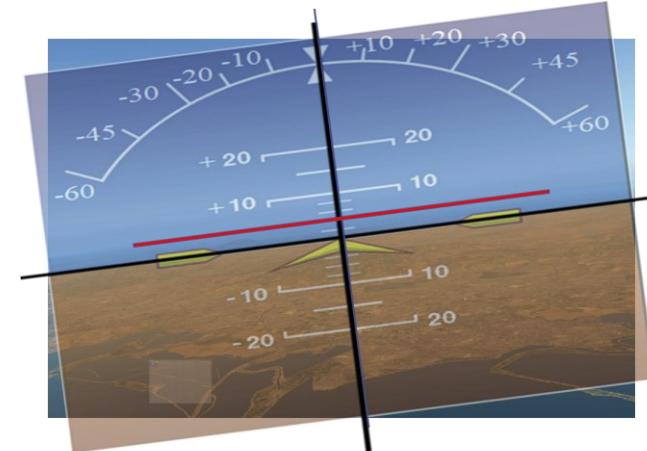
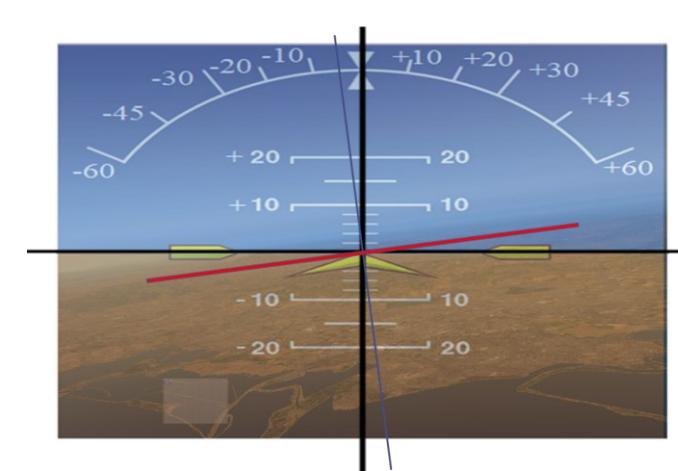
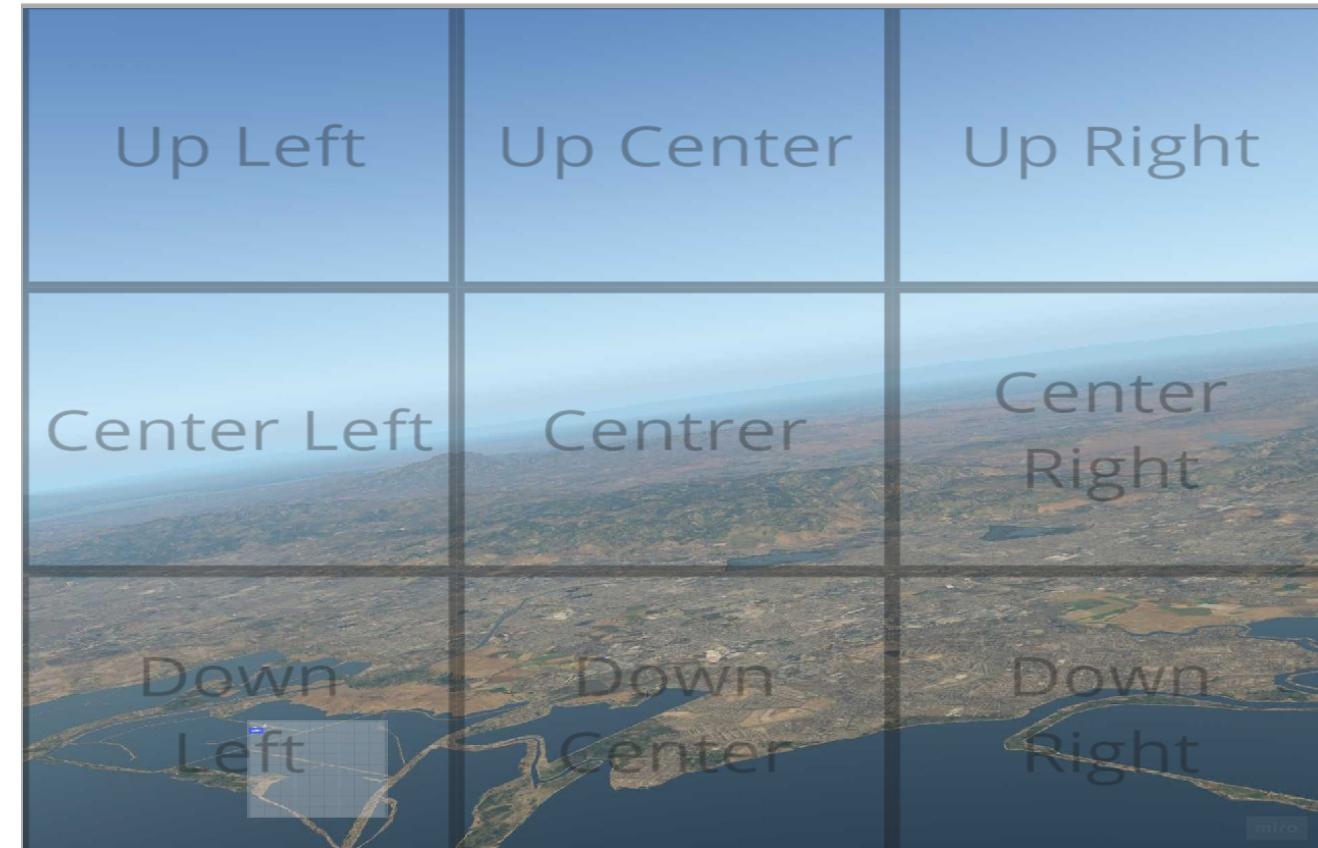


Testing Batch 1

XDUNL
YWXAT
PNJXI
OFTDC
SPCOB
NTEZX
VETOE
XJEAR
LCTR D
RMZXX
SIRUG
YWYPK
VF MJC
CBSNTD
TKADFE

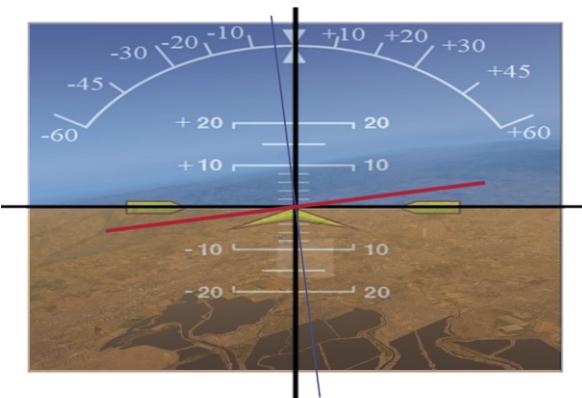
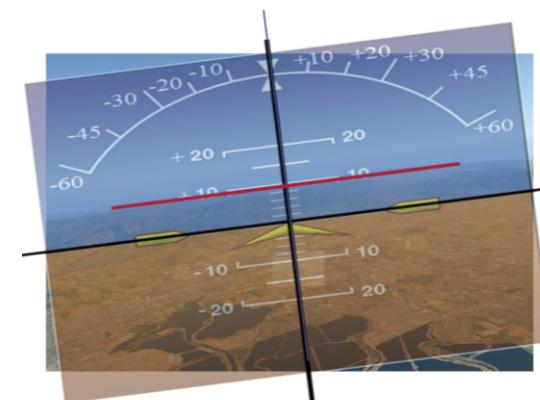
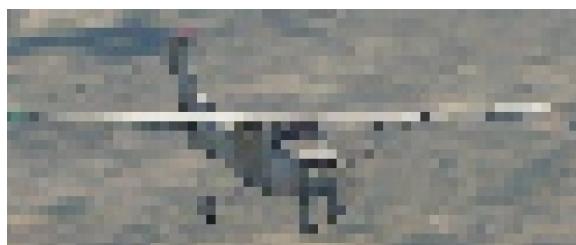
5.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	morning, 11:02:35
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	down left
TOI's 3D orientation	front down left
Horizon attitude	Roll: -5, Pitch: 5



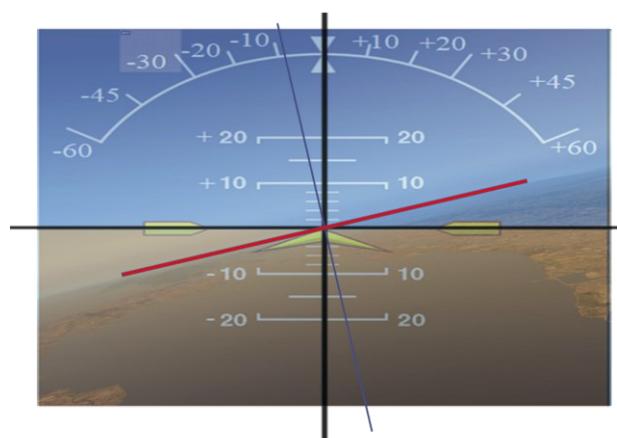
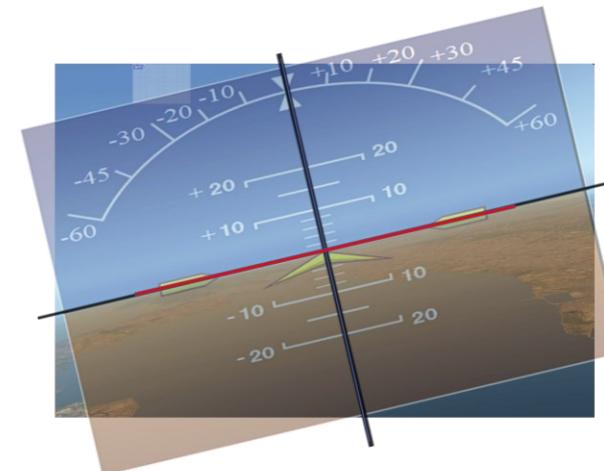
6.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	Afternoon, 17:36:15
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/3 = 2187$
TOI's Pictorial positioning	center
TOI's 3D orientation	front down right
Horizon attitude	Roll: -5, Pitch: 10



9.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	afternoon, 13:49:48
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/2 = 3280.5$
TOI's Pictorial positioning	Up left
TOI's 3D orientation	rear up left
Horizon attitude	Roll: -9, Pitch: 0



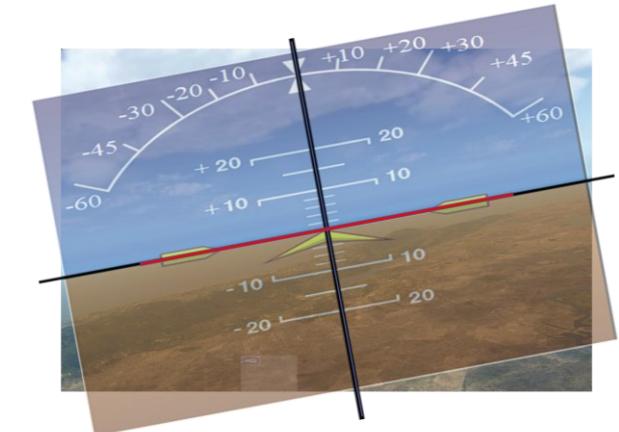
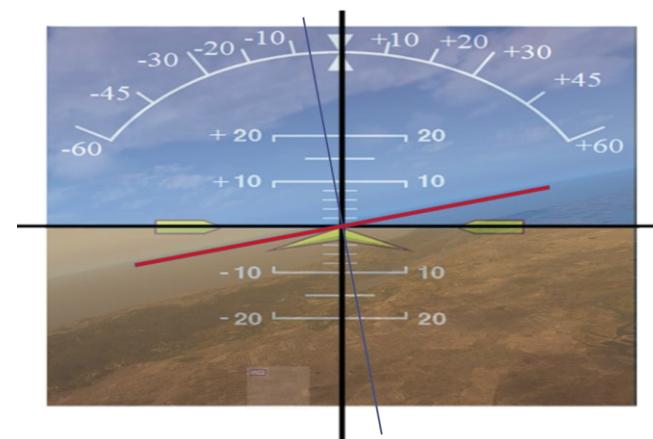


Testing Batch 2



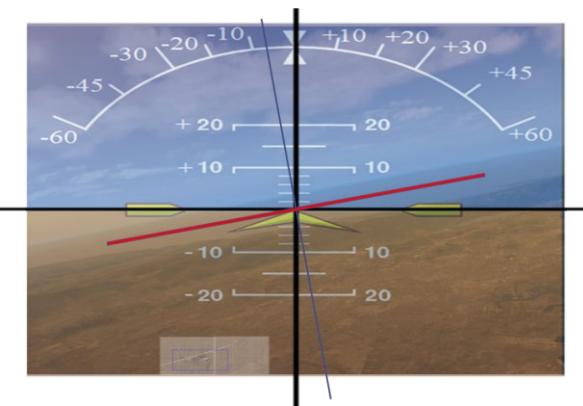
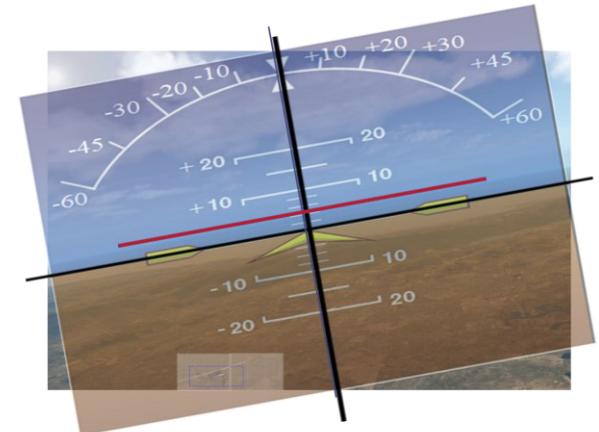
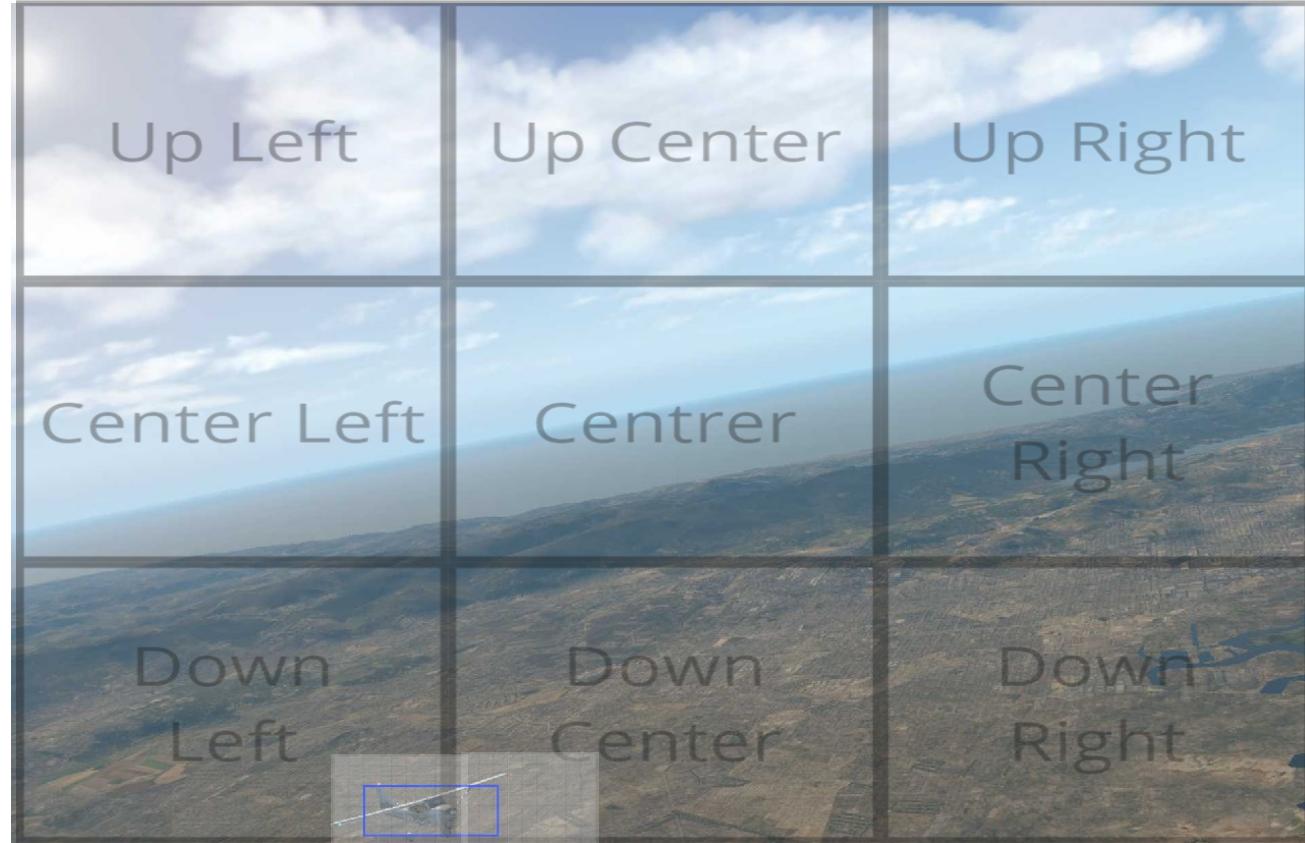
15.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	morning, 10:30:24
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/6 = 3280.5$
TOI's Pictorial positioning	down center
TOI's 3D orientation	rear down right
Horizon attitude	Roll: -8, Pitch: 0



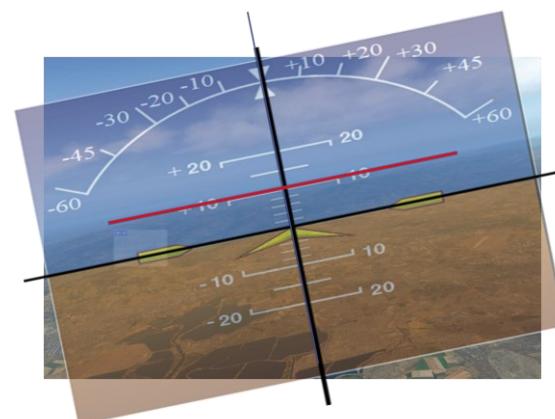
16.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	late afternoon, 18:16:27
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/108
TOI's Pictorial positioning	down left
TOI's 3D orientation	front down right
Horizon attitude	Roll: -7, Pitch: 4



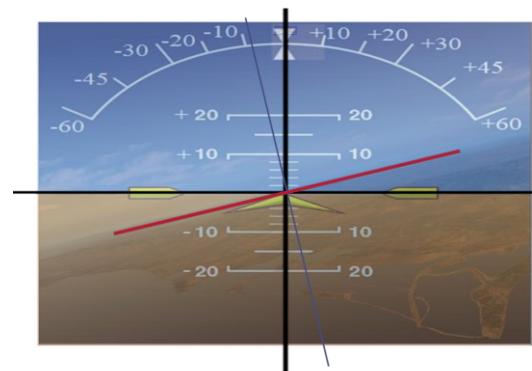
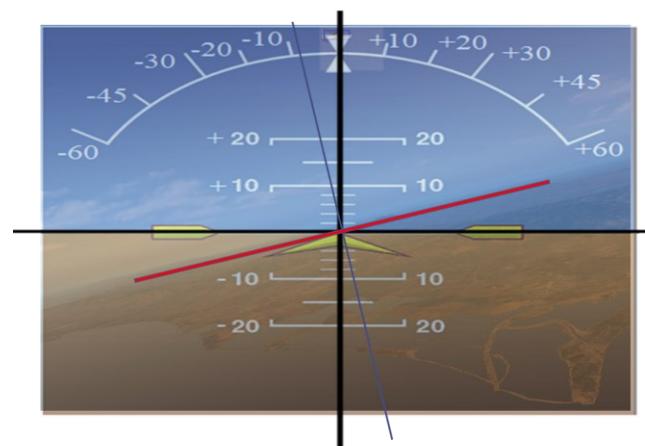
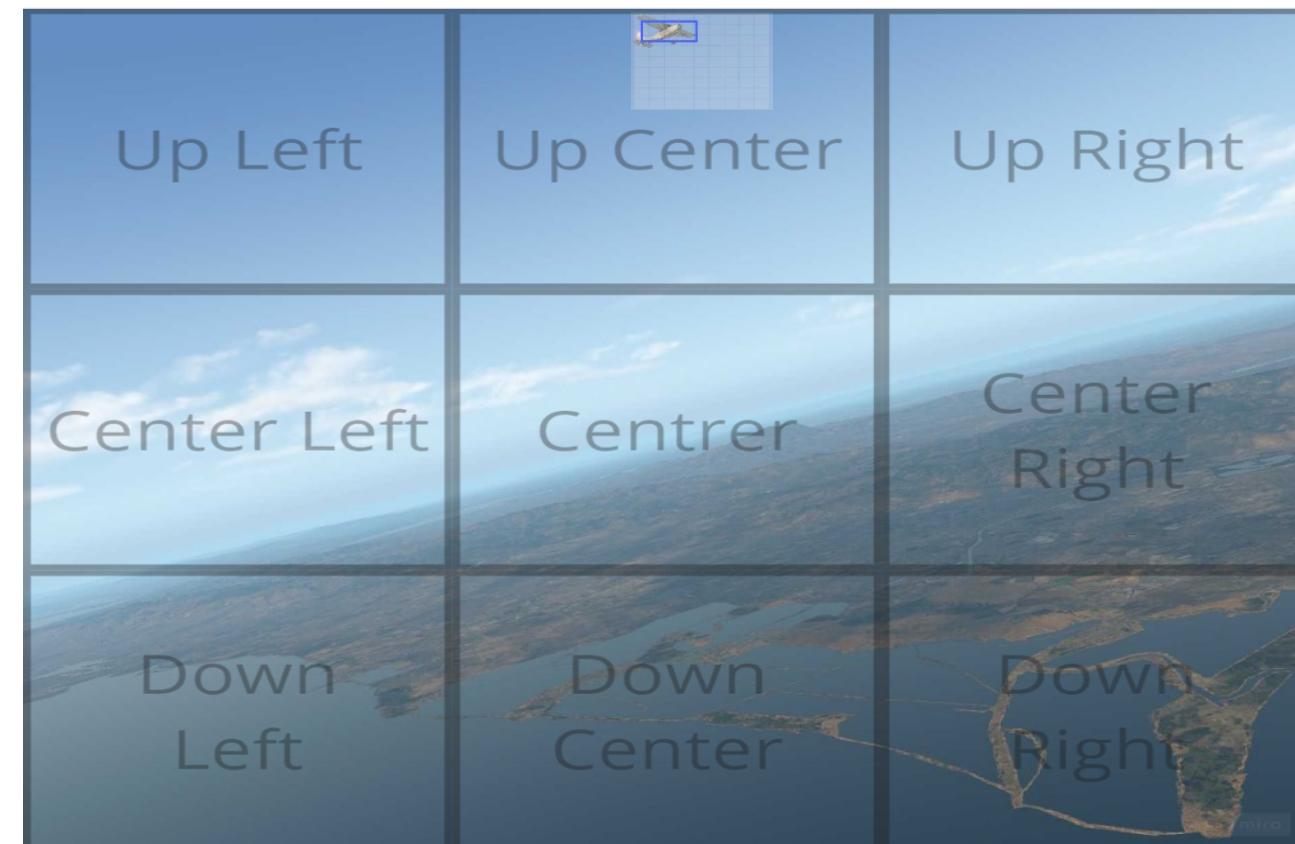
17.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	morning, 09:10:48
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/2 = 3280.5$
TOI's Pictorial positioning	center left
TOI's 3D orientation	rear up left
Horizon attitude	Roll: -8, Pitch: 10



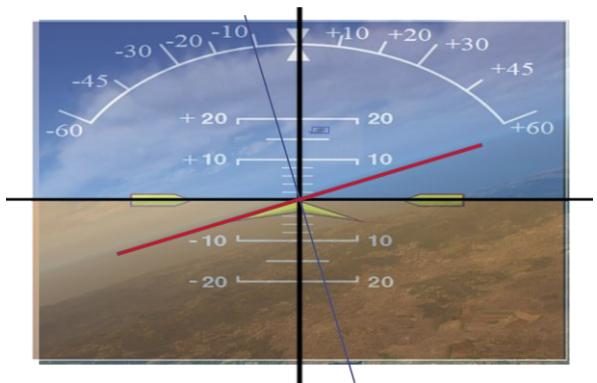
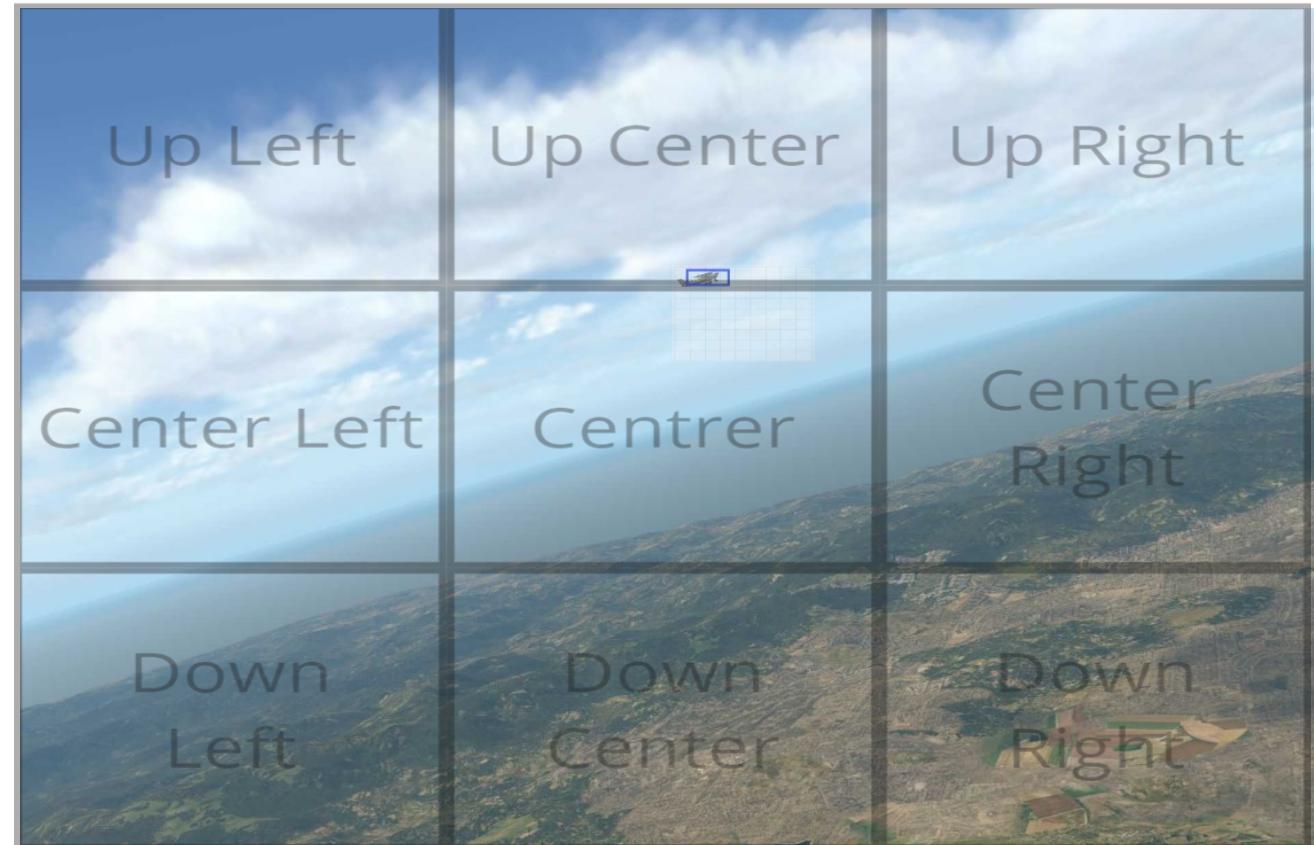
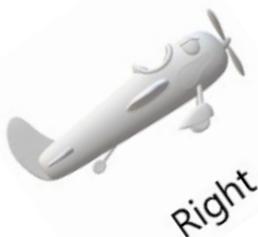
18.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	afternoon, 14:13:05
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/12 = 546.75$
TOI's Pictorial positioning	up center
TOI's 3D orientation	front up right
Horizon attitude	Roll: -9, Pitch: 0



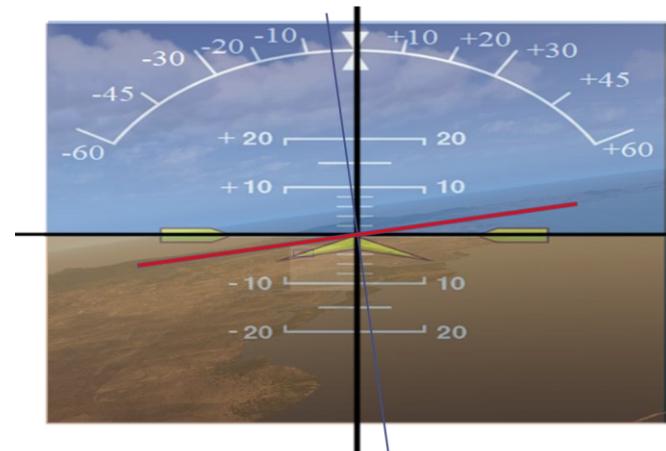
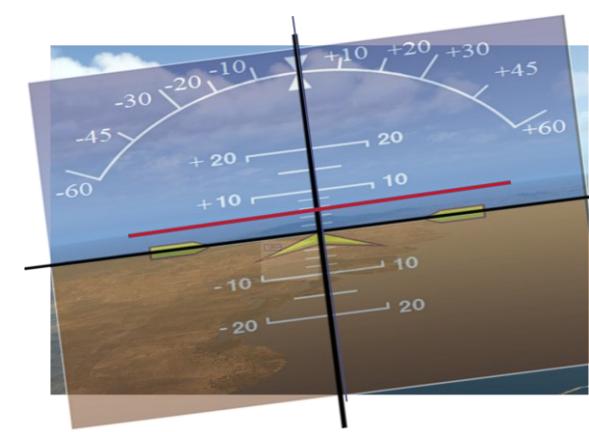
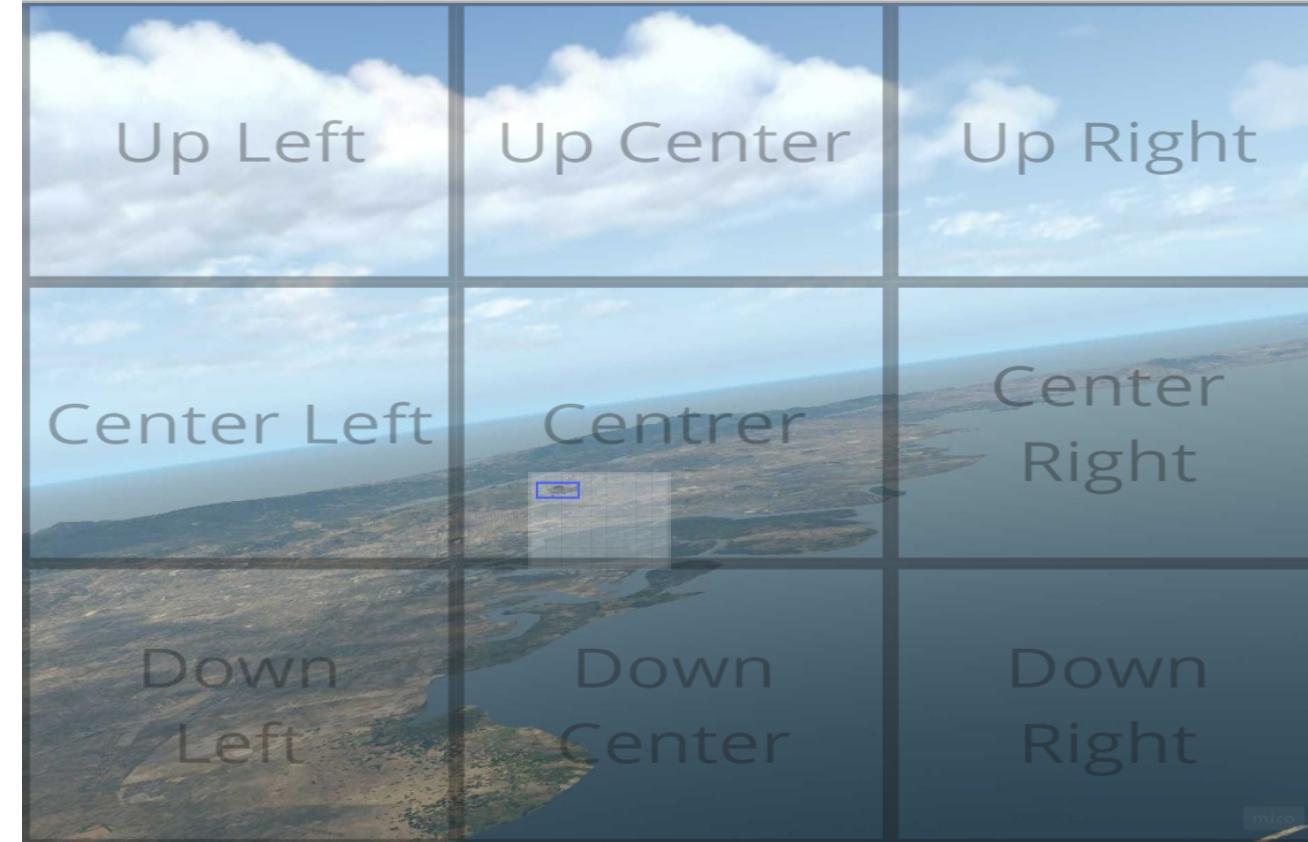
25.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	afternoon, 14:13:05
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/6 = 1093.5$
TOI's Pictorial positioning	up center
TOI's 3D orientation	right
Horizon attitude	Roll: -10, Pitch: 0



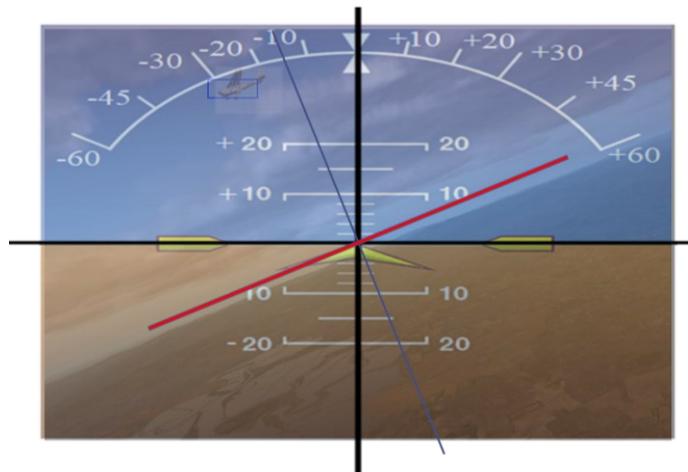
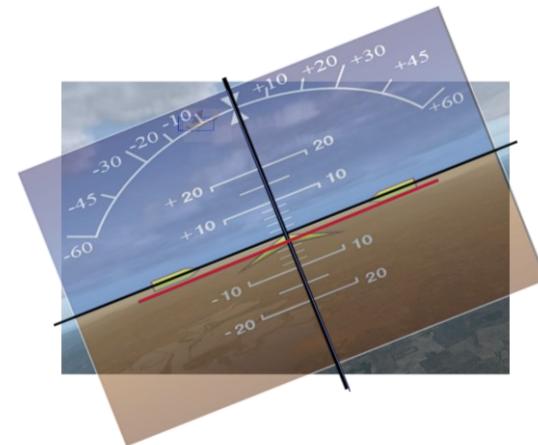
29.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	morning, 09:59:40
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/8 = 820.125$
TOI's Pictorial positioning	center
TOI's 3D orientation	Front up left
Horizon attitude	Roll: -5, Pitch: 6



37.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	morning, 01:05:05
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/41 = 160$
TOI's Pictorial positioning	Up left/up center
TOI's 3D orientation	rear up left
Horizon attitude	Roll: -15, Pitch: 2

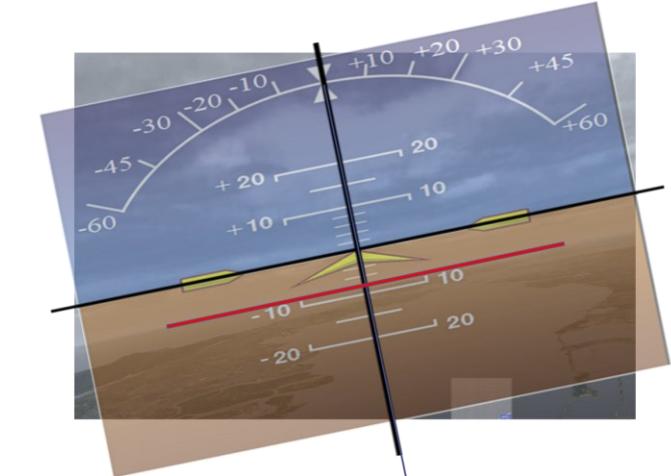
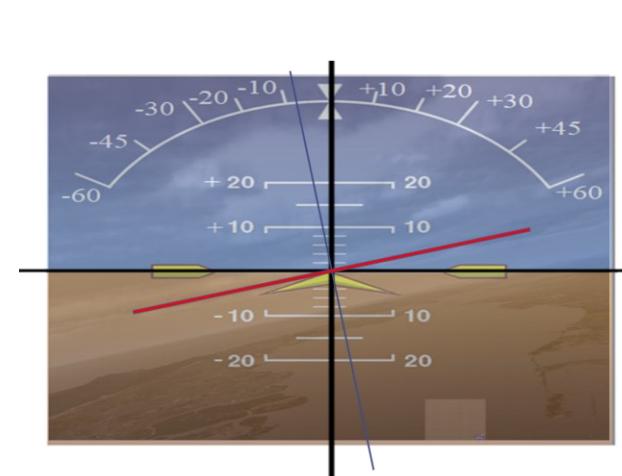
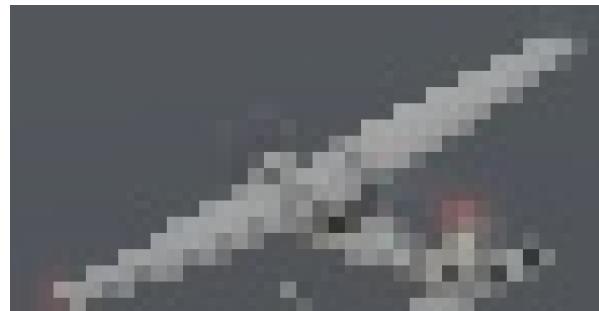


Testing Batch 3



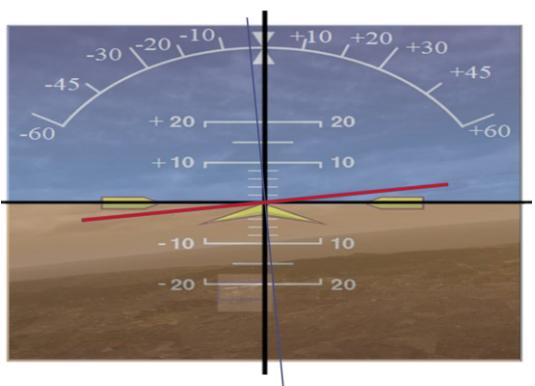
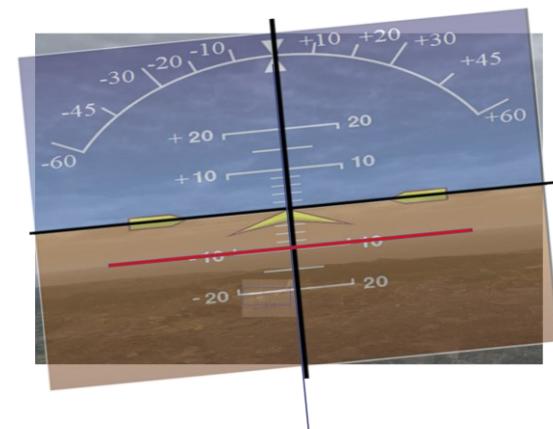
45.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast
Time of Day	late afternoon, 23:33:10
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/4 = 1640.25$
TOI's Pictorial positioning	down right
TOI's 3D orientation	rear down right
Horizon attitude	Roll: -8, Pitch: -8



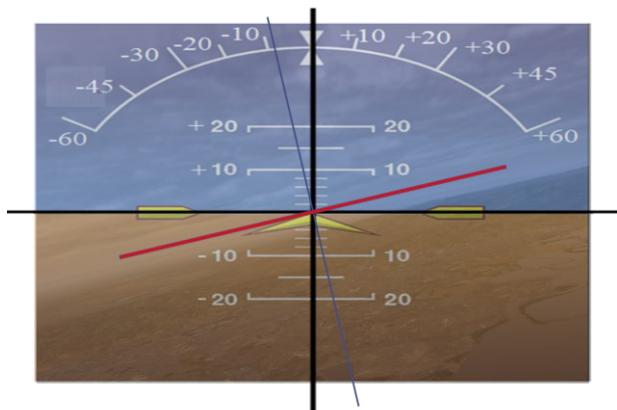
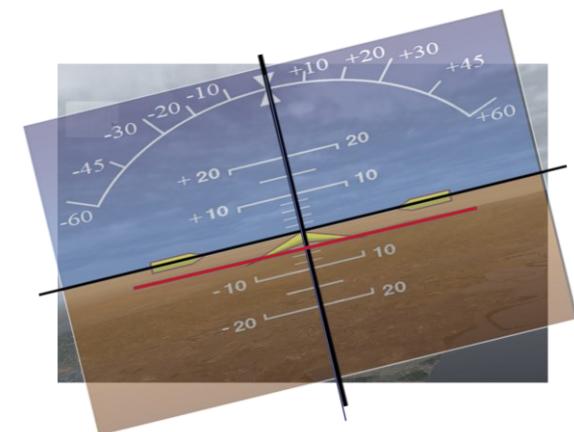
46.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast
Time of Day	morning, 10:03:07
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/54 = 121.5$
TOI's Pictorial positioning	down center
TOI's 3D orientation	front down left
Horizon attitude	Roll: -4, Pitch: -10



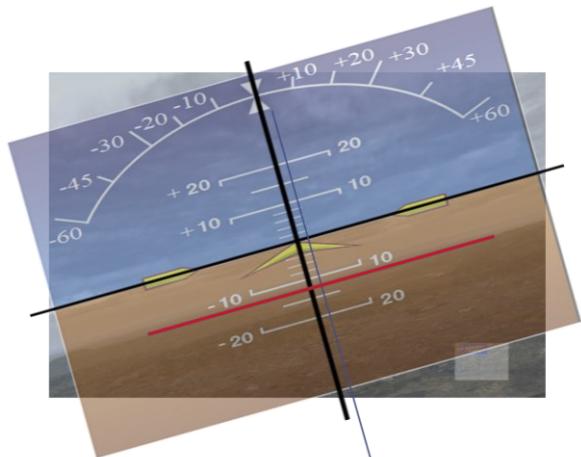
48.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast
Time of Day	late afternoon, 19:56:48
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	up left
TOI's 3D orientation	rear up left
Horizon attitude	Roll: -10, Pitch: -4



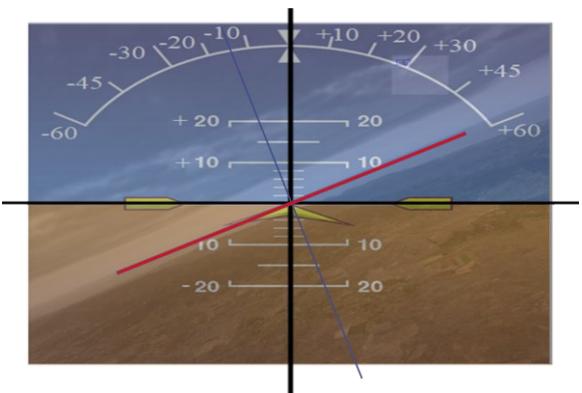
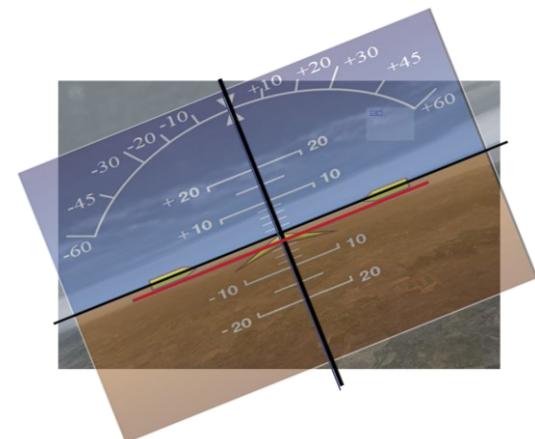
49.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast,
Time of Day	Morning 03:07:55
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/19 = 345.31$
TOI's Pictorial positioning	down right
TOI's 3D orientation	rear down right
Horizon attitude	Roll: -10, Pitch: -12



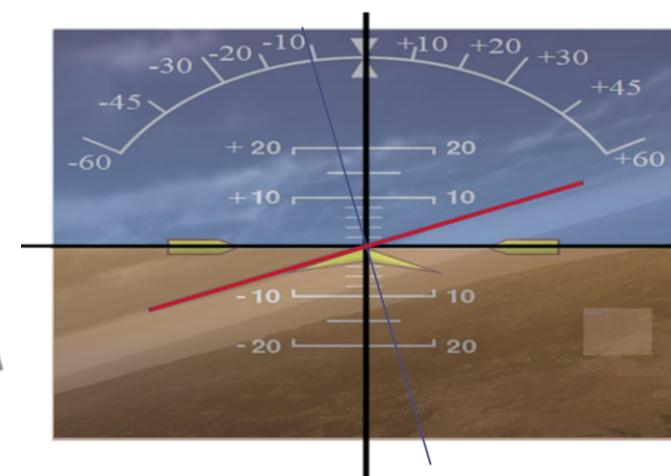
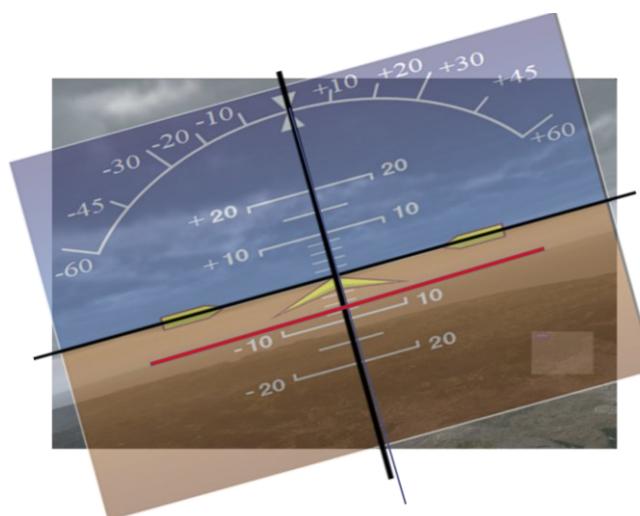
57.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	morning, 03:07:55
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/8 = 820.125$
TOI's Pictorial positioning	up right
TOI's 3D orientation	rear up center
Horizon attitude	Roll: -15, Pitch: -2



58.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	Midday 11:07:56
Cuneiform Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/3 = 2187$
TOI's Pictorial positioning	down right
TOI's 3D orientation	front down left
Horizon attitude	Roll: -10, Pitch: -5



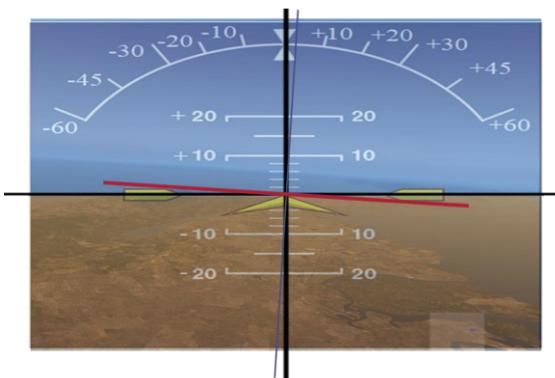
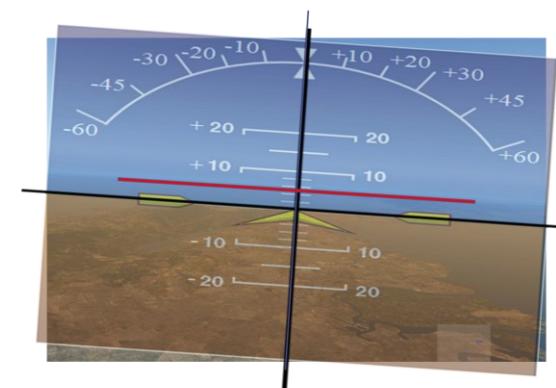
Testing Batch 4

XDUNL
YWXAT
PNJHI
OFTDC
SPCOB
NTEZX
VETOE
XJEAR
LCTR D
RMZHX
SIRUG
YWYPK
VF MJC
CBSNTD
TKADFE

2 7
e 6
Y82670 1 25
052 6
a 6
4 5
n 5
x 5
n 5
s 5
3 2 1
0 1 2
7 8 9
AC
Y

7.jpg

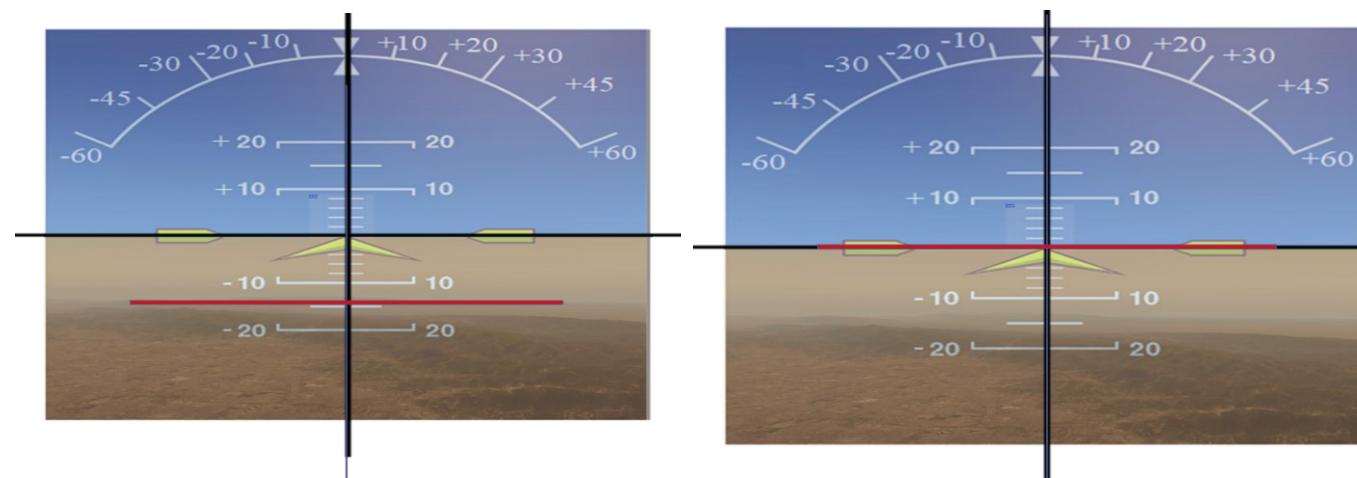
ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	morning, 06:24:02
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	down right
TOI's 3D orientation	Front down right
Horizon attitude	Roll: 3, Pitch: 5



8.jpg

ODD Dimension	Training class spec
Weather Conditions	clear
Time of Day	Afternoon, 15:11:08
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	center
TOI's 3D orientation	unknown
Horizon attitude	Roll: 0, Pitch: -14

Unknown
Orientation?

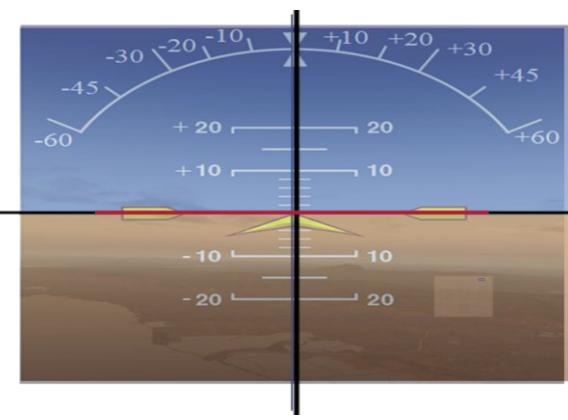
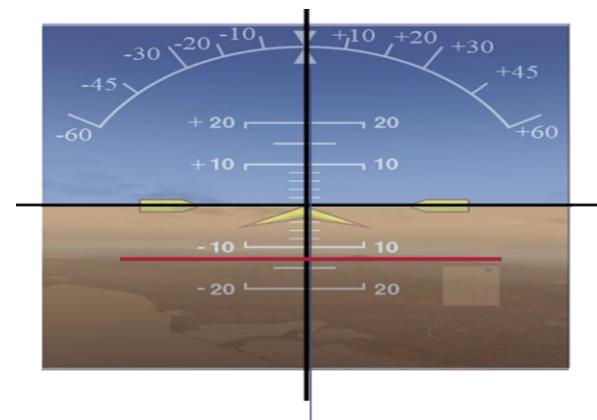
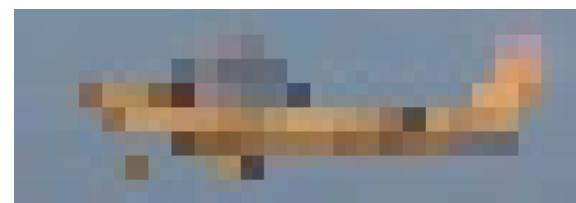


19.jpg

ODD Dimension	Training class spec
Weather Conditions	high cirrus
Time of Day	morning, 08:27:31
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/2 = 3280.5$
TOI's Pictorial positioning	down right
TOI's 3D orientation	left
Horizon attitude	Roll: 0, Pitch: -12



Left



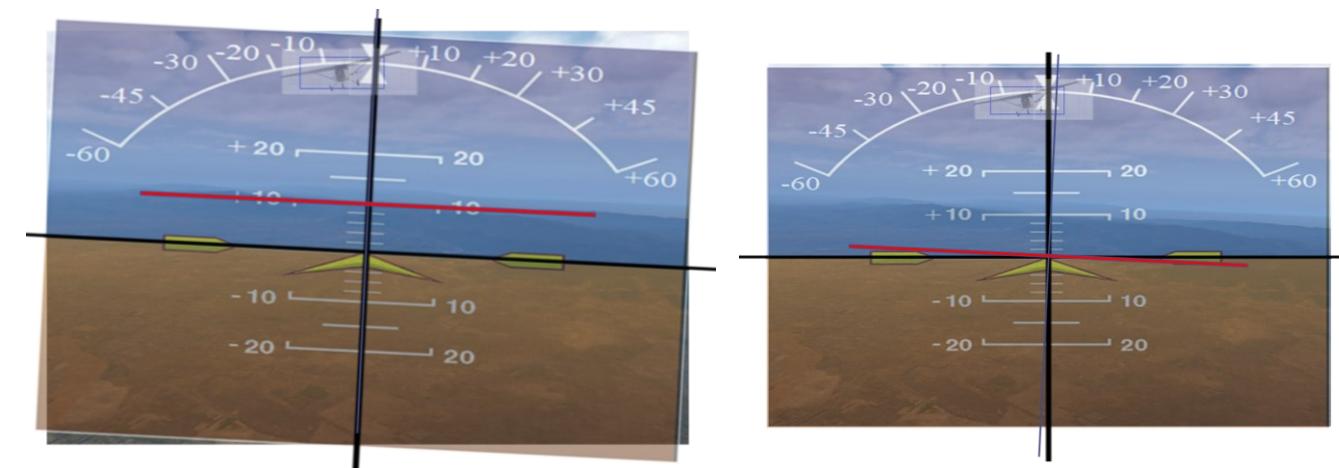
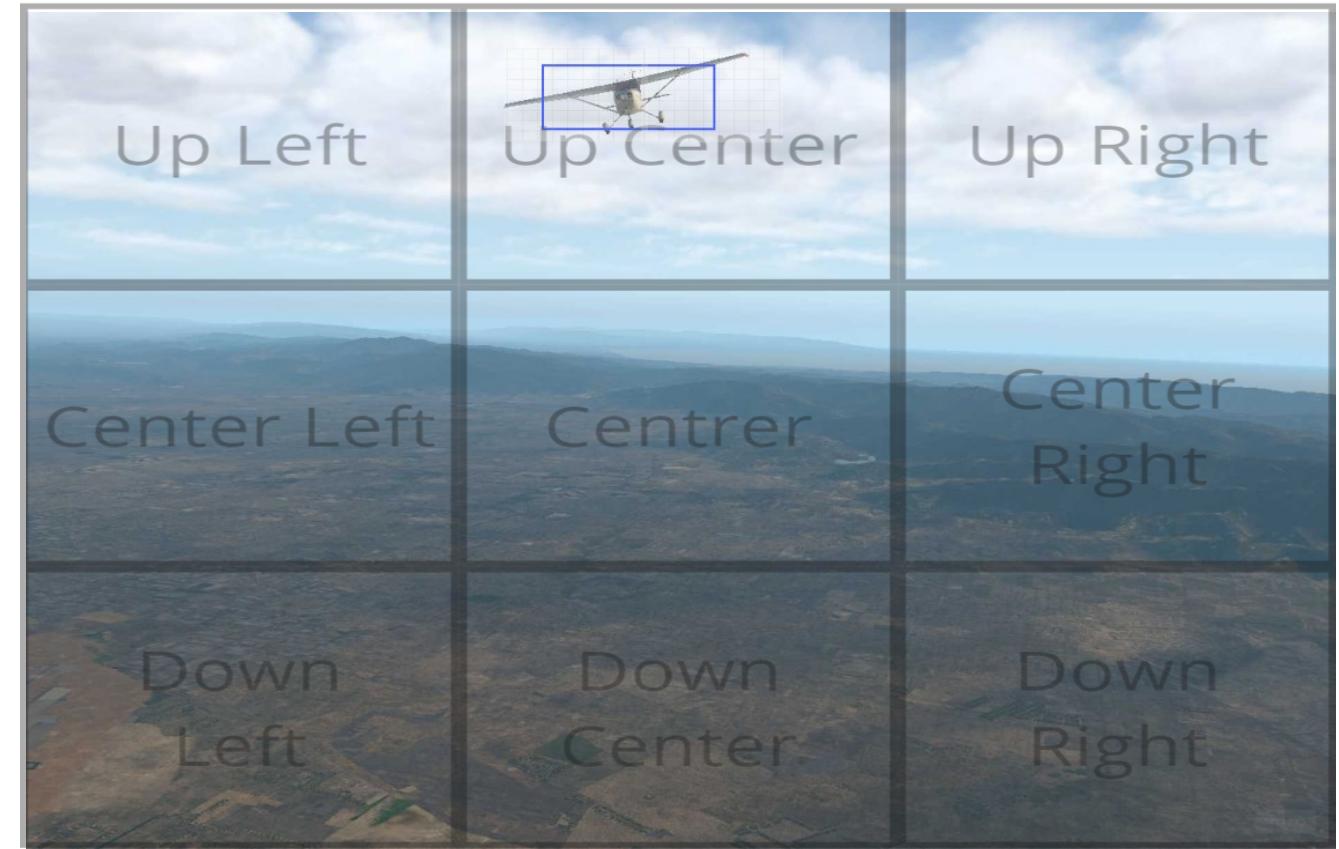


Testing Batch 5



27.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	late afternoon, 19:35:32
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/117 = 56.07$
TOI's Pictorial positioning	up center
TOI's 3D orientation	front
Horizon attitude	Roll: 2, Pitch: 10

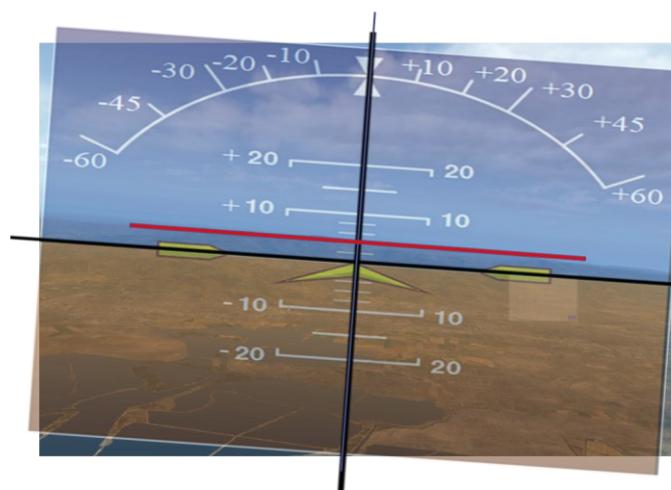


28.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	morning, 06:05:57
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	center right
TOI's 3D orientation	rear down right
Horizon attitude	Roll: 4, Pitch: 5



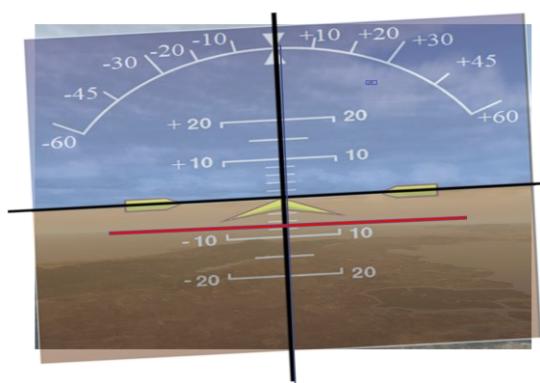
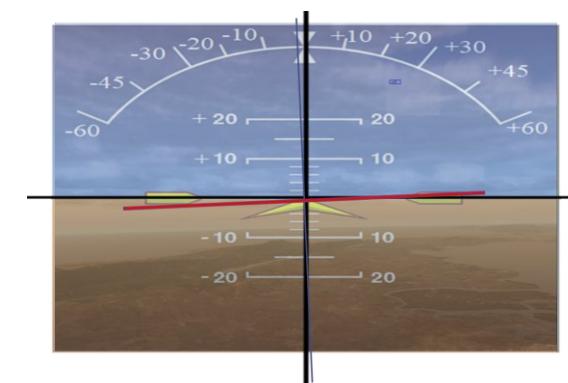
Rear down right



36.jpg

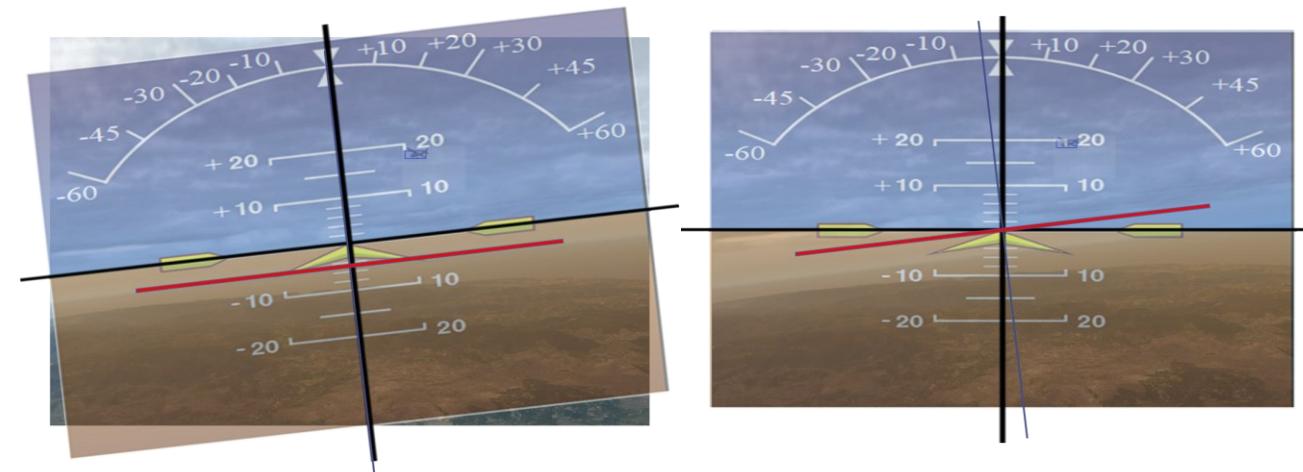
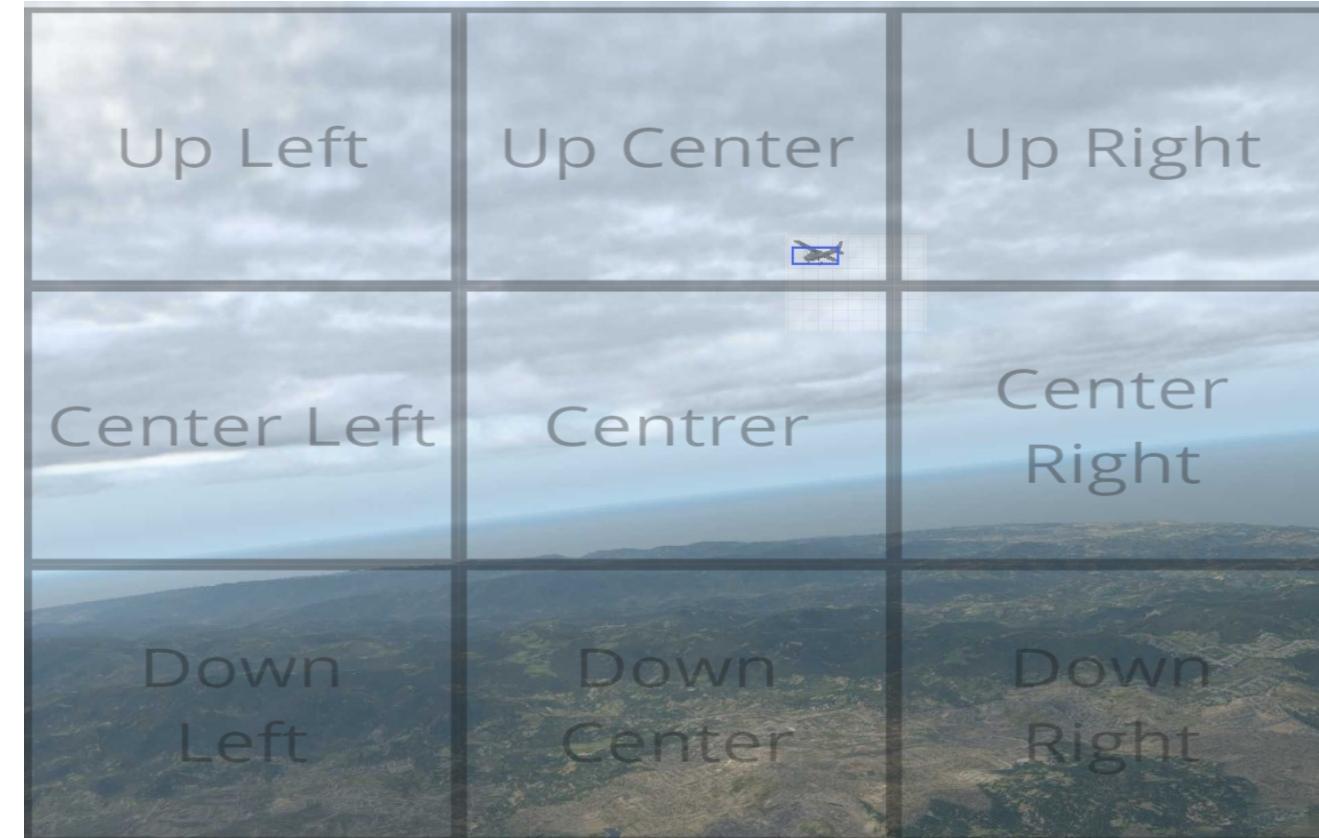
ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	morning, 02:49:44
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/4
TOI's Pictorial positioning	up right
TOI's 3D orientation	Unknown
Horizon attitude	Roll: -1, Pitch: -5

Unknown
Orientation?



38.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	morning, 00:00:07
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/12
TOI's Pictorial positioning	up center
TOI's 3D orientation	rear up left
Horizon attitude	Roll: -5, Pitch: -5



Testing Batch 6

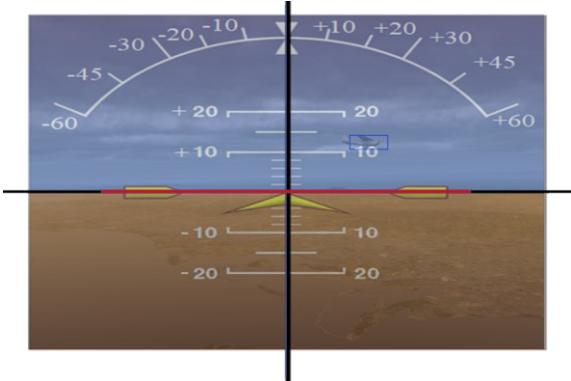
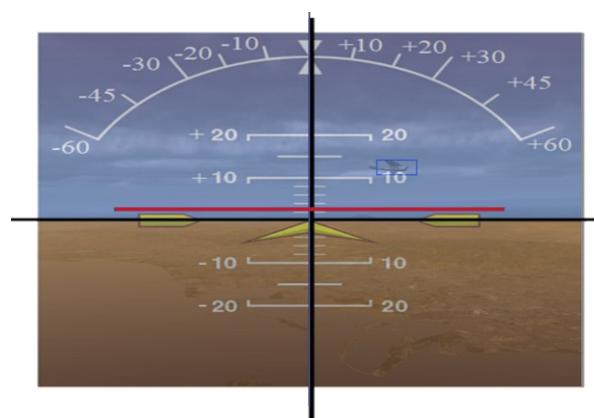


47.jpg

ODD Dimension	Training class spec
Weather Conditions	overcast
Time of Day	Morning, 00:20:06
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/28 = 234.3$
TOI's Pictorial positioning	Center/center right
TOI's 3D orientation	right
Horizon attitude	Roll: 0, Pitch: 2

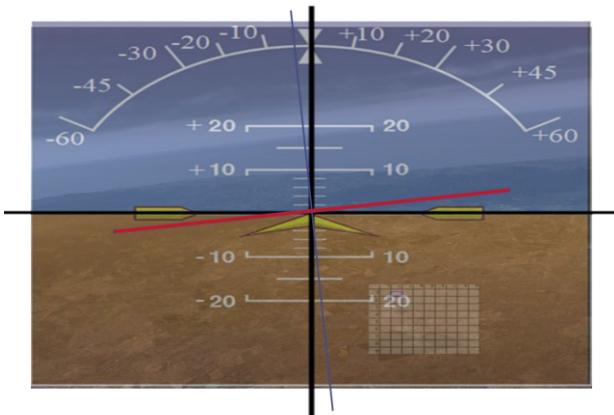
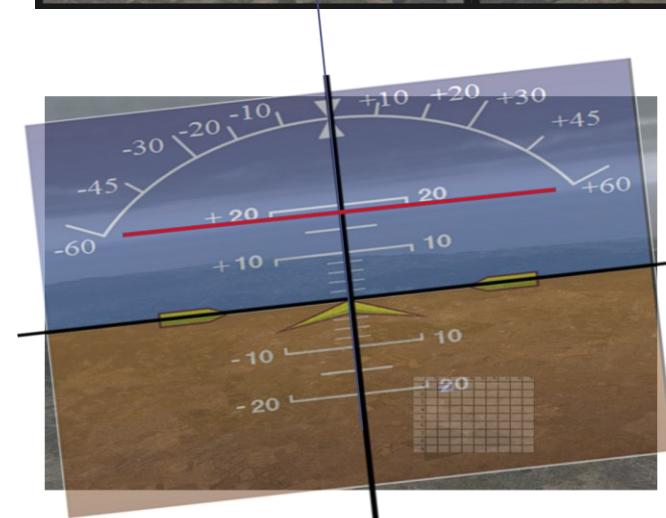


Right



56.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	morning, 00:56:41
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/2
TOI's Pictorial positioning	down center
TOI's 3D orientation	rear down right
Horizon attitude	Roll: -4, Pitch: 19





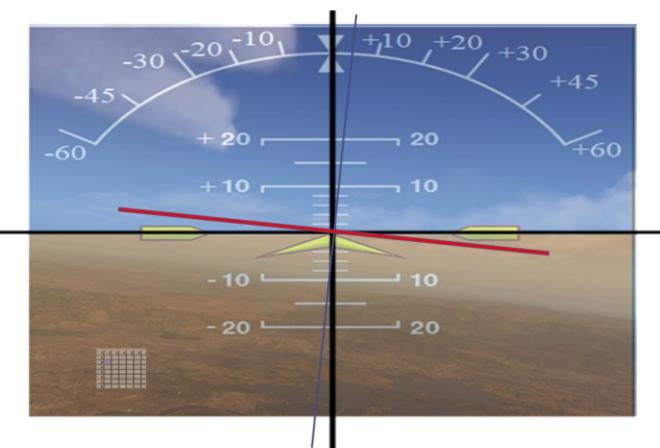
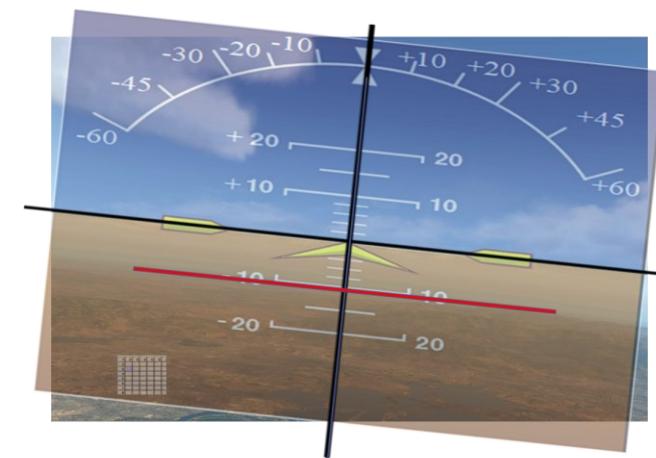
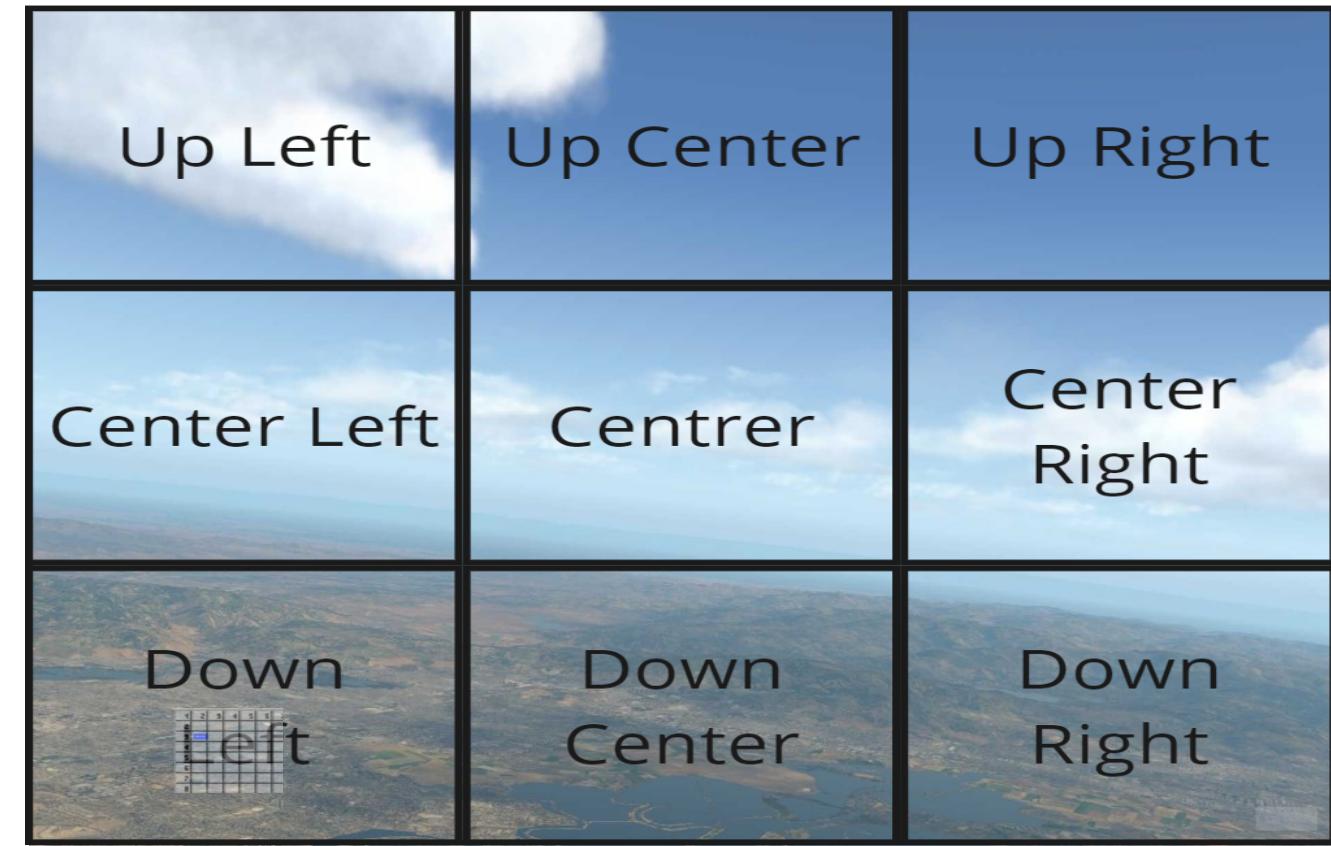
Testing Batch 7



26.jpg

ODD Dimension	Training class spec
Weather Conditions	scattered clouds
Time of Day	afternoon, 15:52:41
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	down left
TOI's 3D orientation	Unkown
Horizon attitude	Roll: 3, Pitch: 10

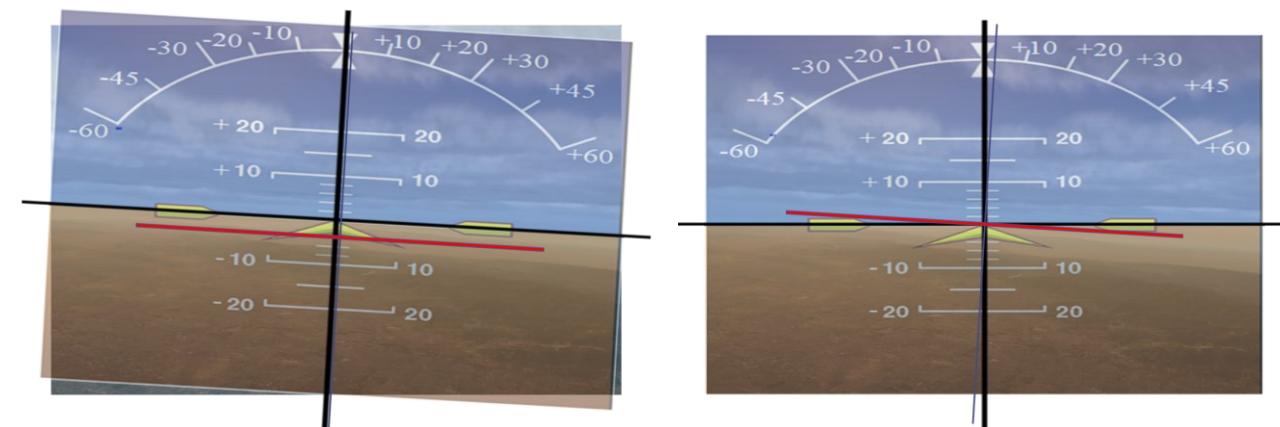
Unknown
Orientation?



35.jpg

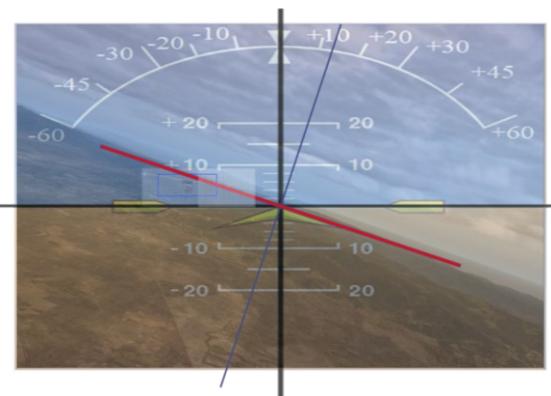
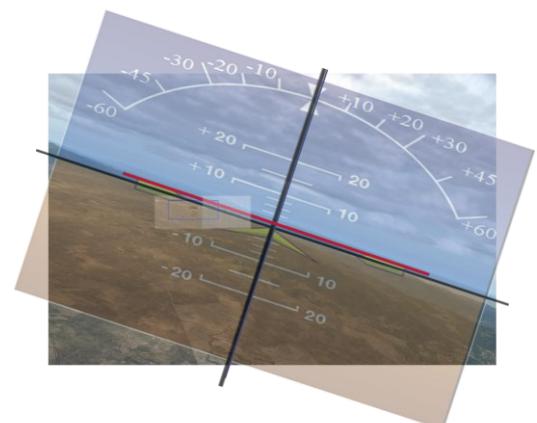
ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	afternoon, 15:35:23
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	Up left
TOI's 3D orientation	unknown
Horizon attitude	Roll: 2, Pitch: -4

Unknown
Orientation?



39.jpg

ODD Dimension	Training class spec
Weather Conditions	broken clouds
Time of Day	late afternoon, 17:50:56
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/81 = 81$
TOI's Pictorial positioning	center left/center
TOI's 3D orientation	front
Horizon attitude	Roll: 13, Pitch: 2



Testing Batch 8

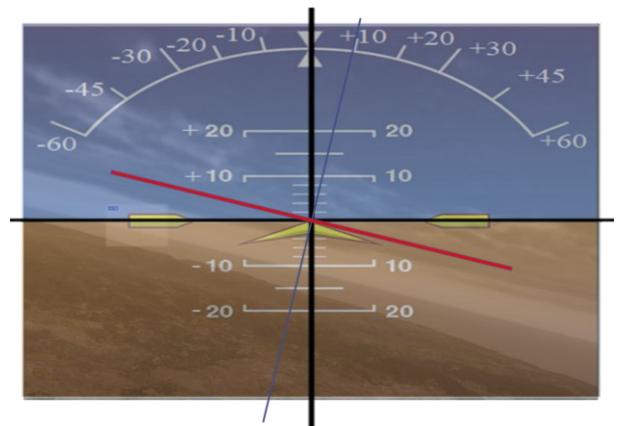
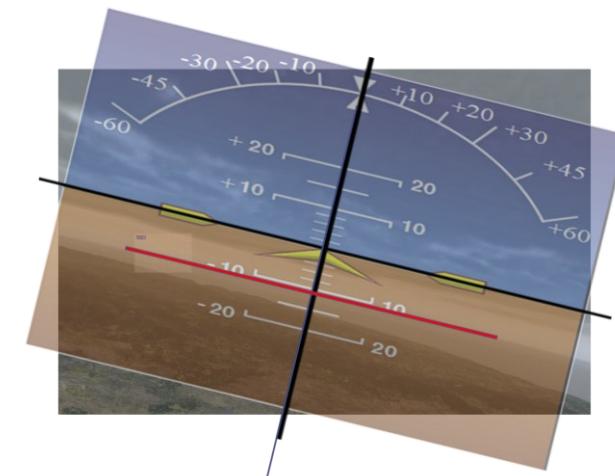
XDUNL
YWXAT
PNJHI
OFTDC
SPCOB
NTEZX
VETOE
XJEAR
LCTR D
RMZHX
SIRUG
YWYPK
VF MJC
CBSNTD
TKADFE

2 7
e C
1 2 5
Y 8 2 7 0
0 5 2 4
a e
4 5
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s
3 2 1
D 7 4
7 1
AC
Y

55.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	late afternoon, 23:01:33
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	$6561/2 = 3280.5$
TOI's Pictorial positioning	center left
TOI's 3D orientation	unknown
Horizon attitude	Roll: 10, Pitch: -11

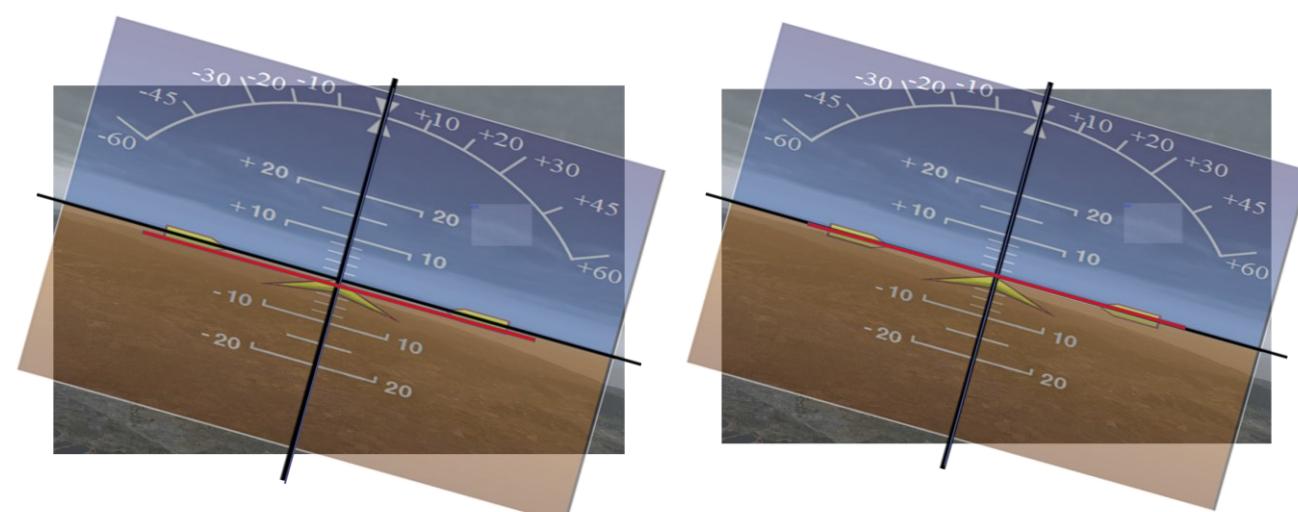
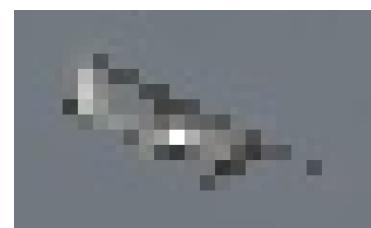
Unknown
Orientation?



59.jpg

ODD Dimension	Training class spec
Weather Conditions	stratus
Time of Day	midday, 12:03:48
CuneiForm Dimension	Training class spec
TOI's pictorial distance (nindans)	6561/1
TOI's Pictorial positioning	up right
TOI's 3D orientation	Unknown
Horizon attitude	Roll: 10, Pitch: -2

Unknown
Orientation?



Cuneiform Canvas

