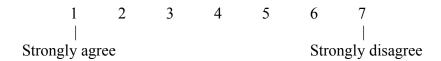**This document is the commented version of the final draft of the questionnaire to be used in the forthcoming final experiments. The purpose is to provide a linkage between the theoretical body and the actual empirical question asked in the experiment.**

Participant ID _____
Condition _____
Animation _____

Landscape Appreciation
Administrator: Marco Ruocco

Circle a number from 1 to 7 to express your degree of agreement or disagreement with each of the following statements:

1) I liked the landscape shown in the animation.

   1   2   3   4   5   6   7
   | |
   Strongly agree   Strongly disagree

   This is the most general preference question. It tests how the landscape is liked in general. In the literature this is commonly the only question asked to subjects in landscape preference research. In this case the question is considered a synthesis of the following "specific preference" questions, and the spatial knowledge, aesthetics and sense of place questions later in the questionnaire. This might be used in multiple regressions to see which of the other specific preference (or all others, for that matter) questions "loads" more on general preference. The strategy here is not to rely entirely on general preference as indicator of experience.

2) The landscape shown in the animation seemed natural:

   1   2   3   4   5   6   7
   | |
   Strongly agree   Strongly disagree

   Evaluative question on the artificial/natural debate, not discussed explicitly in the proposal. It was included to see if the Plain Cruise condition from the air looked more artificial than from the ground: preliminary pilots show that it might be the case, and it might be a useful characterizing dimension of landscape.

3) I liked the level of naturalness that I found in the landscape.

```
       1      2      3      4      5      6      7
       |                                  |
Strongly agree                     Strongly disagree
```

Preference for naturalness is specific preference for a characterizing dimension of landscape.

4) The landscape shown in the animation seemed closed.

```
       1      2      3      4      5      6      7
       |                                  |
Strongly agree                     Strongly disagree
```
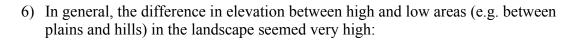
This question relates directly to the landscape visual design literature, in particular capturing the specific effects of valleys (Silver Canyon condition) to be visually closed and plains to be visually open, inducing specific feelings of closure.

5) I liked the level of closeness that I found in the landscape.

```
       1      2      3      4      5      6      7
       |                                  |
Strongly agree                     Strongly disagree
```

Specific preference on closeness. Originally openness and preference for openness were also tested, but in order to economize on questions, and to reduce the occurrence of conflicting questions, they have been removed from this last draft (i.e. how can a subject agree on a level of closeness that is not the mirror image of the level of openness? Otherwise openness and closeness would not a pure semantic differential, here transformed in two Likert scale questions for maintaining the anchor of the rest of the questionnaire. My semantic knowledge of openness and closeness as a visual feature did not allow more than tailoring the question to the Silver Canyon (valley) condition and measuring Plain Cruise (plain) as a form of non-closeness, instead of directly openness.)

6) In general, the difference in elevation between high and low areas (e.g. between plains and hills) in the landscape seemed very high:

```
        1      2      3      4      5      6      7
        |                                  |
Strongly agree                     Strongly disagree
```

Measures the first variable of the participant's spatial knowledge of terrain. The question is a verbal form of asking an opinion on topographical range, or relative relief, statistically determined in the literature (reviewed but not in the proposal) as a first measure of terrain morphology.

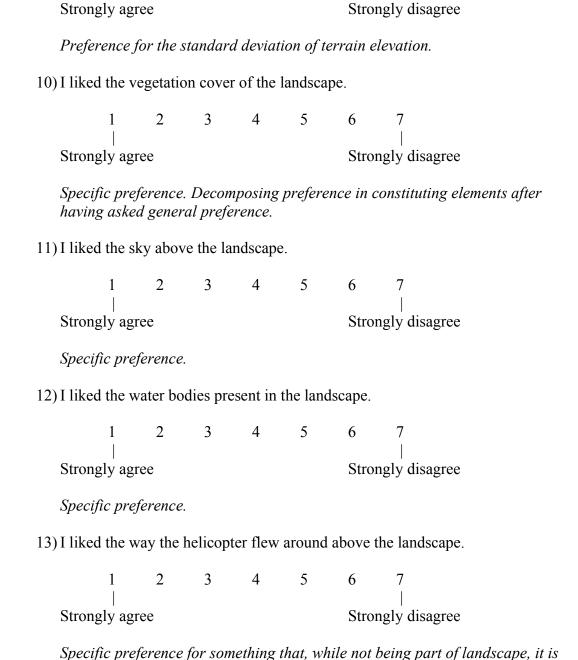7) I liked the elevation differences present in the landscape.

```
        1      2      3      4      5      6      7
        |                                  |
Strongly agree                     Strongly disagree
```

Preference on the amount of relative relief in the terrain.

8) The roughness of the landscape shown in the animation seemed very high:

```
        1      2      3      4      5      6      7
        |                                  |
Strongly agree                     Strongly disagree
```

Roughness is the standard deviation of terrain elevation. Here it can be used in the intuitive sense of how many bumps, at multiple scales, there are in the landscape. Standard deviation is the second measure characterizing terrain form statistically.

9) I liked the level of roughness of the landscape.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Preference for the standard deviation of terrain elevation.

10) I liked the vegetation cover of the landscape.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Specific preference. Decomposing preference in constituting elements after having asked general preference.

11) I liked the sky above the landscape.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Specific preference.

12) I liked the water bodies present in the landscape.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Specific preference.

13) I liked the way the helicopter flew around above the landscape.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Specific preference for something that, while not being part of landscape, it is part of the exploration of landscape. It is kept generic (originally I thought about asking to draw alternate trajectories, but it would be beyond the scope of the experimental task). This question is expanded further in the next section of open-ended questions.

Answer the following questions in the space provided:

14) What did you like about the landscape, if anything?

_____
_____
_____
_____
_____
_____

15) What did you dislike about the landscape, if anything?

_____
_____
_____
_____
_____
_____

These open-ended questions are supposed to give more space to elaborate on the general and specific preference of landscape, maybe including elements and interpretations not comprised in the structured questions. It might be that participants are primed by the previous structured questions in their answers, but considering the pilots, participants actually remain "open" in their answers.

16) What did you like about the way the helicopter flew around, if anything?

_____
_____
_____
_____
_____
_____

17) What did you dislike about the way the helicopter flew around, if anything?

_____
_____
_____
_____
_____
_____

As mentioned before, these questions address trajectory preference. They are made to elicit statements like "too low" or "too high", or "too slow" and maybe the degree to which participants feel creative in exploring the landscape. A better use of the questions could be done if each participant was given a particular task, such as "study the topography" or "concentrate on trajectory", so that the trajectory would be "too low for something" but here it is preferred to consider the full range of human-landscape relations without generating specific tasks.

Follow the instructions below, and write and draw in the spaces provided.

18) In the space provided below, draw a map of the landscape that you have been shown as if you were looking at it from above (i.e., a bird's eye view). Try to provide information about the topography of the landscape, indicating the location of features such as valleys, ridges, peaks, etc. Put verbal labels on the map to define the objects that you have drawn. Then, on the map, draw the line representing the trajectory of the helicopter on the landscape, as if you were looking at it from above.

19) In the space provided below, describe in your own words all the features you have drawn on your map.

_____
_____
_____
_____
_____
_____
_____
_____

These two questions are related to spatial knowledge. The literature regards sketch maps as methods to extract spatial knowledge from participants. The interest is placed on topography and landscape elements, and it is asked to relate the "how" the landscape is explored (the trajectory) with the "what" the landscape is like. The latter is not a difficult task, considering straight trajectories are used throughout the experiment. The answers might be coded by means of considering general extent, detail and a qualitative judgment on the quality of the map.

20) In the space provided below, draw the line of the surface of the landscape flown over by the helicopter, from the start to the end of the animation, as if you were looking at it sideways from the ground (i.e., draw the profile view, or cross-section, of the landscape). Indicate variations in elevation such as those caused by valleys and ridges. Then, on top of that, draw the trajectory of the helicopter, as if you were looking at it sideways from the ground (i.e., draw the profile view of the trajectory of the helicopter), indicating variations, if any, in helicopter altitude during the animation. Remember to label both profiles.

START   END

21) In the space provided below, describe in your own words all the features you have drawn on your map.

_____
_____
_____
_____

These two questions conclude the spatial knowledge questions. Now, landscape and trajectory are considered in a profile view. This is useful especially to verify the awareness of the participant of the terrain-following or uniform nature of the trajectory (interesting effects in the pilot about high uniform trajectory over irregular terrain perceived as terrain-following), and also their spatial knowledge about the topography of the landscape they are flying over.

Circle a number from 1 to 7 to express your degree of agreement or disagreement with each of the following statements:

22) There were elements in the landscape that did not fit well with each other.

$$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$$

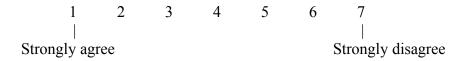Strongly agree   Strongly disagree

Aesthetics questions. This is about the Kaplan's concept of Coherence, and uses the wording expressed in the literature (coherence as elements that "fit" well with each other). Coherence is tested by two different questions (22 and 23). The factor loading of the two questions is not known, but they seem two reasonable angles to look at the same Coherence construct.

23) The landscape made sense to me overall.

$$1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7$$
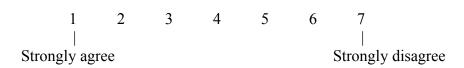
Strongly agree   Strongly disagree

Aesthetics question. Second Coherence question, this time focusing specifically on Immediate Understanding of the scene, that is, if the scene makes sense or is obviously "contradictory". To justify two questions on Coherence it might be said that a landscape can make sense while being formed of highly contrasting elements: for example, a shanty town close to a skyscraper in Rio de Janeiro is a contrasted scene but it is accepted as a landscape. Conversely, a dock next to a sloping lake "fits" but "does not make sense". This is just to say that it is still Coherence but with two different aspects incorporated in it. The literature usually shows how Coherence is qualitatively evaluated by "experts" but I could not find a factorial "structure" to use in this research.

24) There was too little variety in the landscape

    ```
    1     2     3     4     5     6     7
    |                             |
    Strongly agree              Strongly disagree
    ```

Aesthetics question. Complexity question, part of the 4 Kaplans' factors. Complexity (Immediate information in Exploration) is often seen as the degree of variety in the landscape.

25) There were many things in the landscape.

    ```
    1     2     3     4     5     6     7
    |                             |
    Strongly agree              Strongly disagree
    ```
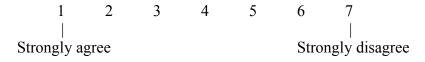
Aesthetics question. Second Complexity question, in this case about the quantity of things in the scene. Therefore we have the variety of different types of things (Q24) and the quantity of things. Further complications have been avoided by means of not considering Complexity as a time dependent phenomenon in this sense: one pilot participant interpreted the slightly different statement "There were too many things in the landscape" as a function of the speed of the helicopter.

26) It would have been easy to find my way around if I was walking on the ground.

    ```
    1     2     3     4     5     6     7
    |                             |
    Strongly agree              Strongly disagree
    ```

Aesthetics question. Legibility (Understanding of Promised Information). This measures the degree to which the participant feels able to navigate in the landscape, without obtaining from him/her a measurement of the actual ability. It is argued that if Legibility loads on General Preference (which is not firmly established in the literature), it is the feeling of being able to navigate that counts, and not the actual ability of doing it.

27) I felt it would be better to find my way around if the helicopter flew closer to the ground.

    ```
    1     2     3     4     5     6     7
    |                             |
    Strongly agree              Strongly disagree
    ```

Aesthetic question. This is an "experiment", since it is a kind of Promised Legibility or Legibility in Exploration. It investigates the response to evaluating one's own

ability to navigate after a change in trajectory. As far as I know it has not been investigated in the literature yet.

28) I felt it would be better to find my way around if the helicopter flew higher above the ground.

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```

Same as above. The directionality higher/lower is tailored to the variable of altitude discussed in the proposal.

29) The part of landscape I saw at the end of the animation was surprising.

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```

Aesthetic question. Surprise is not the same of Mystery, and there is something in the literature on their difference. Basically I interpret Surprise as actual information not matching promised information, while Mystery is the condition of actual information to direct the attention to promised information. This is an ad-hoc question for condition "Ynez Peak" where the low-flying trajectory reveals the ocean while the high-flying trajectory is more predictable.

30) During the animation I was curious about what I was going to see next in the landscape.

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```

Aesthetic question. Mystery question, specifically. In this case, the time domain is within the animation, that is, the promised information (triggering curiosity) of the actual information as it is progressively unfolding in front of the participant.

31) I felt this landscape was a pleasant place to be in.

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```

Aesthetic question. Habitat question. The far-fetched intention of this question is to relate aesthetical general preference to well-being in the landscape, that, in turn, is related to a quick evaluation of the ability to survive in the landscape, in line with Habitat Theory

(although the evolutionary implications are not investigated), as discussed in the proposal.

32) I could easily see what was going on around me.

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```
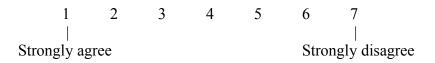
Aesthetic question. Relates to Prospect-Refuge theory by Appleton, discussed in the proposal, and aims at testing the ability of the participant to develop a feeling of "control" on the surroundings, which, according to the theory, is related to general preference.

33) I felt sheltered by the surrounding landscape

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```

Aesthetic question. Other Prospect-Refuge question, this time testing the refuge component of the theory and, at the same time, the visual landscape variable of closeness of landscape that provides "shelter". Choosing the term "sheltered" and not "exposed" is consistent with choosing "closure" and not "openness" in Q4 and Q5.

34) If I imagine people standing on the landscape and looking upwards, the helicopter was very visible to them.

```
        1      2      3      4      5      6      7
        |                                  |
   Strongly agree                    Strongly disagree
```
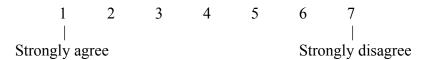
Aesthetic question. This addresses the issue of "being seen" as factor of preference. Previous wordings included the expression "feeling to be in the spotlight" which resulted in a high variance of interpretations in the pilots, which was not desirable. This wording is less explicit but still touches on the concept of "exposure".

35) The landscape was unique.

```
        1      2      3      4      5      6      7
        |                                  |
    Strongly agree                  Strongly disagree
```

Sense of Place question. The Likert question allows disagreement but not a degree of quantification with the level of uniqueness, in line with the meaning of the term.

36) The landscape had a specific character.

```
        1      2      3      4      5      6      7
        |                                  |
    Strongly agree                  Strongly disagree
```

Sense of Place question. Originally it was "distinct character", but distinctiveness and uniqueness were overlapping. The idea is to distinguish between a unique place (the only one of a kind) and a common landscape that has character (i.e. any instance of Tuscan hill). This questions relates to Aesthetics very closely, in that it is evaluative in nature and based on a variety of information types (spatial knowledge in primis).

37) The landscape was easy to remember.

```
        1      2      3      4      5      6      7
        |                                  |
    Strongly agree                  Strongly disagree
```

Sense of Place question. This is about the memorability of the place. In a factorial analysis it might be the case that memorability, character and complexity covary.

38) The scenery offered by the landscape was striking.

```
        1      2      3      4      5      6      7
        |                                  |
    Strongly agree                  Strongly disagree
```

Sense of Place question. Another SOP concept very close to scenic evaluation and general preference. In this case it is classified under SOP and not aesthetics because it was originally found in the literature to be a dimension characterizing sense of place. The semantic boundaries between concepts, in fact, seem fuzzy.

39) The way the helicopter moved around was exciting.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Emotion question. It is the only emotion-related question. This entire class of questions has not been included because it was not related to the cognitive level of analysis of this study. However, I found interesting to sample emotion with a simple, common sense question. It is expected that low-flying trajectories might give more excitement for the very nature of the visual motion.

40) I would have liked to explore the landscape some more after the end of the animation.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Misc Question. It is a composite question, about desire of exploration, which might also load on Mystery, since it is related to the relationship to promised information that the actual information of the animation has provided.

41) I felt I could see a large enough portion of the landscape at any given time.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Misc. Question. This is about the feeling of visibility, or the idea that the participant finds his/her "viewshed" satisfactory for his/her general appreciation of landscape.

42) I felt myself present in that landscape.

```
     1     2     3     4     5     6     7
     |                             |
Strongly agree                Strongly disagree
```

Misc. Question. Presence has been discussed in the proposal in the Planetary Exploration literature, and here it measures the same variable of the ability to function in the landscape.

43) I would like to know more about that landscape.

```
        1     2     3     4     5     6     7
        |                             |
   Strongly agree              Strongly disagree
```
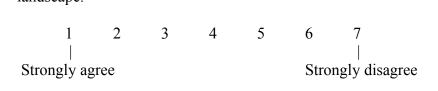
Sense of Place. In the literature it is thought that knowing about a landscape is a first step towards developing Sense of Place. This question measures the only case of not-strictly-aesthetical SOP and might lead to more general comments about the attachment to landscape when seen from above or from close to the ground.

44) I feel there is not much more to see in that landscape beyond what was shown in the animation.

```
        1     2     3     4     5     6     7
        |                             |
   Strongly agree              Strongly disagree
```

Misc Question. Measures the amount of promised information in the participant after all the actual information has been shown. This is a knowledge question that precedes, for example, curiosity or desire to explore.

45) Any slight movement of the helicopter offered me a different view on the landscape.

```
        1     2     3     4     5     6     7
        |                             |
   Strongly agree              Strongly disagree
```

Mystery Question. This is the "official" take on Mystery as defined in the literature, that is, the degree to which some slight movement is able to generate promised information.

46) The helicopter flew around too slowly.

```
        1     2     3     4     5     6     7
        |                             |
   Strongly agree              Strongly disagree
```

Misc. Question. This is about speed, and it has been included although speed is not manipulated in the animations. However many casual observers were noticing the different apparent speed in the two altitude conditions. In a between-subjects design this might suggest that speed has to be tailored to altitude for a comfortable viewing, and that altitude therefore is also a control on the dynamic aspects of animation.

47) The animation has shown a realistic landscape.

```
    1      2      3      4      5      6      7
    |                                  |
Strongly agree                    Strongly disagree
```

Misc. Question. This question might help in considering the degree to which the visualization was a good representation of reality. Imperfections in the visualizations would be reported here, and it might be useful as an additional variable in general preference regressions.