2. TYPES OF PARAMETERS AND FEATURES USED FOR IDENTIFICATION OF AEROSPACE OBJECTS AND PHENOMENA

This section of the **Manual** sets out: requirements for a set of parameters and features of AOP necessary for their initial identification; general parameters and features of AOP, parameters and features of AOP location in space and their movement.

The primary identification is based on key visually observable **features** and measurable **parameters** of the AOP, including the visible outline, shape and details of the AOP, possible acoustic and light effects, motion characteristics, etc.

Requirements for a set of parameters and features for visual observations of AOP:

- they should comprehensively characterize the AOP in order to make an identification with a high level of confidence;
- they should be measured using available tools and instruments;
- they should have known limits of variability for different observation conditions.

Below there are the main parameters and features that are used to describe the observed AOP, its recognition, methods and units of measurement. Data on some parameters and features can be obtained both with the help of technical means and devices (see above) and as a result of direct visual observation [10].

2.1. General parameters and features of an aerospace object or phenomenon

Maximum possible observation time. It characterizes the period during which an AOP can be observed: from the first manifestations to its complete disappearance. This parameter may or may not coincide with the actual observation time of the AOP (a characteristic of a specific observation, not the AOP as a whole), which is measured from the moment of detection or appearance of the AOP to the moment of the end of observation or disappearance of the AOP. It is measured in seconds.

Outline. The outline is a qualitative feature that characterizes the contour of the observed AOP; it can be clearly defined, have a varying degree of blurring or merging with the environment, background, and be variable. If the outline changes during observation, each stage of such changes is described.

Shape. The shape of the AOP is initially indicated in accordance with analogies with simple geometric shapes and known bodies. In the detailed description, the specifics of the shape and its individual elements are indicated, etc. If the shape changed during the observation, the sequence of its changes (polymorphism) is indicated. The shape is a qualitative feature of the description of the AOP.

Color. The color of the AOP is a qualitative feature of its Description For clarity, illustrative material in the form of eyewitness drawings, preferably photos, videos, etc. should be attached.

Linear dimensions. At the initial stage, the parameter of the diametric size of the circle described around the visible outline of the AOP is determined. Subsequently, if possible, the sizes of individual parts, elements of the AOP, are determined. If a group of objects/ phenomena with synchronous movement is observed, it is advisable to calculate both the sizes of individual NSAs and the group as a whole. If during the observation there were changes in the size of individual parts, elements of the AOP, then their dimensions are indicated sequentially. Linear dimensions are measured in meters.

Angular dimensions. The parameter of the angular dimension is determined with the help of technical means and devices, as well as meters a result of direct visual observation, by analogy with known objects and relative values. Angular dimensions are measured in angular degrees.

Light effects. The light effects are one of the defining parameters and features of the description of AOP. The peculiarities of localization and possible changes in light effects over time are described by qualitative indicators (parameters), but the size of the rays, brightness, etc., can be expressed quantitatively only (as a features). In particular, the maximum and minimum observed brightness of AOP can be represented in candela/square meter.

Thermal signatures. The thermal signatures can be determined accurately only with the help of technical devices. Indirectly, the temperature of the AOP may be indicated by light effects and the effects of interaction with the environment. As a parameter of AOP, its temperature in Celsius degrees is indicated, as well as qualitative features of its distribution. If the temperature distribution is uneven, it is indicated for all individual visible parts and zones of the AOP.

2.2. Parameters and features of the location of an aerospace object or phenomenon in space

Number. Single AOP can be observed, as well as groups of them, series, for example, aircraft formation, swarms of drones, etc. Sometimes it can be difficult to identify whether an AOP is a single object or a group of disparate objects. In this case, an in-depth analysis of this quantity parameter is used or various options are considered.

Configuration. During the observation of multiple AOP, their relative position is important. The configuration is a qualitative feature that is supported by illustrative material (drawings, photos, videos, screenshots, etc.).

Altitude. The altitude of the AOP is important information and one of the key parameters for identification. The altitude is measured in

meters from the ground surface level or from the sea level to the AOP. During visual observations, when there is a variation in altitude values, its maximum and minimum possible values are analyzed separately.

Angle to the horizon. This parameter is measured in degrees, from the horizontal parallel to the ground to the AOP or their group. With a variable angle above the horizon, the altitude at the beginning of the observation and at the end of the observation is indicated.

The direction of observation. This parameter is calculated as an azimuth (clockwise angle between the north direction and the object/ phenomenon). The direction of observation is measured in angular degrees.

2.3. Parameters and features of movement of an aerospace object or phenomenon

Maximum hover time. A parameter that characterizes the period from the visual static stop of the AOP to the continuation of its movement. The hover time may be visual evidence from the observer and may not be a capability of the AUV itself, for example, an aircraft moving in a plane towards or away from the observer may appear to be hovering in one place. Hover time is measured in seconds.

Trajectory. This feature can be straight, close to straight, or curved. When recording an observation, a complex trajectory is described step by step, with its breakdown into separate characteristic sections, with reference to time and reliance on spatial external landmarks. The trajectory is mainly described qualitatively, but its changes can be supplemented by a geometric description of measurable individual sections, etc.

Linear velocity. It is one of the key parameters for identifying AOP. It is measured in meters/second.

Angular velocity. A measured in degrees/second. It can be visually assessed by how many of its own angular dimensions the AOP passes per unit of time.

Acceleration. If the velocity of the AOP did not change during the observation, then there are no accelerations, the movement is uniform. If there is a change in the velocity of the AOP over time on a certain part of the trajectory, this indicates acceleration or deceleration, i.e. accelerated or decelerated movement. Positive or negative acceleration can also be assessed as steady or increasing. This parameter measured in meters/second squared, with a "+" or "-" sign.

Direction of movement. This parameter is determined by the cardinal points, indicating all stages of possible change during the movement of the AOP. It is measured as an azimuth in degrees. It should be noted that the direction of movement of an AOP is measured in the coordinates of the AOP itself.

Turning radius. If a moving AOP changed direction (made a turn) on certain parts of the trajectory, the key parameters are the values of the radii of such changes. The minimum value of the turning radius is of the greatest scientific value. It is measured in meters.

Angular turning speed. This parameter characterizes the ability of an AOP in motion to change its trajectory within a short time. High turning speeds are of scientific value, so, in addition to a detailed description, the maximum value is indicated if the turning speed varies during the observation. It is measured in degrees/second.

If the AOP parameters change during the observation, its description is divided into stages (phases), each of which describes the AOP states in detail.

When calculating the variability of parameters, their defined interval maximum and minimum values are indicated.