

## A Preliminary Study of 300 cases of Unidentified Aerial Phenomena (UAP) Reported by Military and Civilian pilots<sup>1</sup>

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### Introduction

Since the end of the 40s, military and civilian aircraft's pilots and crews report sightings and flight encounters with "lights" or "objects" which are not looking like any known aircraft or aerial phenomena.

Dr Richard F. Haines<sup>3</sup>, has given the following definition for the term UAP (1980): *"An unidentified aerial phenomenon (UAP) is the visual stimulus that provokes a sighting report of an object or light seen in the sky, the appearance and/or flight dynamics of which do not suggest a logical, conventional flying object and which remains unidentified after close scrutiny of all available evidence by persons who are technically capable of making both a full technical identification as well as a common-sense identification if one is possible."*

The following study and statistics were based on a selection of 300 cases of UAP sightings reported by civilian and military pilots. These cases were selected among 448 cases from the AIRPANC Catalogue (1<sup>st</sup> edition May 2009), compiled by the author.

#### 1. Méthodology (selection of cases for the analysis):

The AIRPANC Catalogue compiles 448 UAP cases reported by military and civilian pilots from 1947 to 2007. These 448 cases are also included in a database which contains 23 factors.

Cases used for this preliminary analysis were selected according to two factors: factor «**provisional result**» and factor «**source**».

a. Factor «**Provisional result**» (PR) included three categories :

Unidentified	<b>UI</b>	<b>432</b>
Lack of Data	<b>LD</b>	<b>8</b>
Probably identified	<b>PI</b>	<b>8</b>

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<sup>1</sup> This report was presented at the GEIPAN steering committee in September 2009. NARCAP acknowledges with grateful thanks the submission of this English language translation from the original version published in 2009.

<sup>2</sup> GEIPAN (Groupe d'Etude et d'Information sur les Phenomenes Aérospatiaux Non-identifiés) is the French official Agency established since 1977 within the French National Center for Space Studies.

<sup>3</sup> NARCAP Science Director and former chief of the Space Human Factors Office at NASA Ames research Center and a former senior research scientist for both NASA and Raytheon.

There is a fourth category « Identified » (ID), but these cases were not included in the catalogue or database.

By the way, « unidentified » does not mean not identifiable. It means only that the pilot was not able to identify the UAP during his observation, neither later on, nor by a following investigation. 1

**b. Factor « source »** distributes the sources of information on the reported case according to the level of « **quality** » on a decreasing scale from de 1 (best quality) to 4.

Source 1 (S1)	Official report (civilian or military)
Source 2 (S2)	First-hand testimony from pilot(s)
Source 3 (S3)	Reference document or book
Source 4 (S4)	Other sources

Sources of type 1 and 2 are the most interesting regarding the level of quality and reliability of the information. Among the 431 “unidentified” cases compiled in the AIRPANC catalogue, 300 cases are from sources type 1 and 2: source 1 (177 cases – 59%) and source 2 (123 cases – 41%).

The following analysis has been based on these 300 cases from sources 1 et 2.

## 2. Analysis:

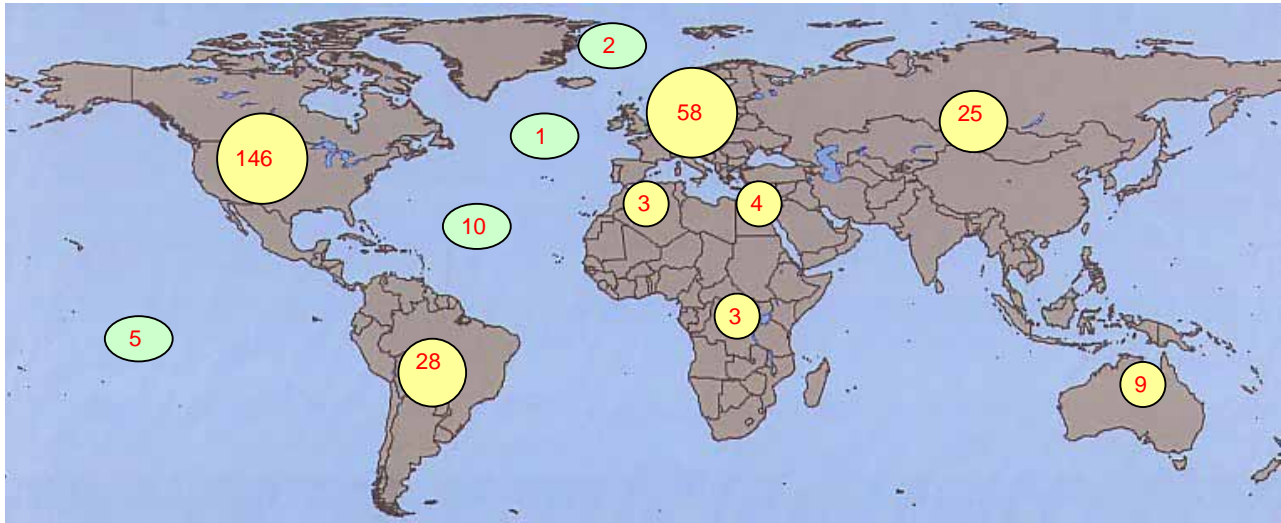
This analysis of 300 cases was realised using 16 among the 23 factors (fields) of th AIRPANC database (cf annex 1). This selection of 300 cases covers a 60 years period of time (1947 à 2007).

### a. **Location (Factor 7) et Ambient lumination (Factor 6)**

The 300 cases are distributed almost **all over the world**. They are located above continental zones (282 cases), including 49 countries and above maritime zones (18 cases). The American continent alone have 174 cases (58%) including 146 cases for North America (Canada and USA). 21 cases were reported in the French airspace

**Table 1: Distribution of sightings by geographic zones (terrestrial and maritime)**

<b>Géographic Zone:</b>		<b>Countries:</b>					
North America	146	Algérie (AL)	2	Iran (IR)	1	Portugal (PO)	4
South America	28	Angola (AN)	1	Italia (IT)	2	Russia / USSR (RU)	2
Europe	58	Argentine (AR)	5	Japan (JP)	8	South Africa (SA)	1
Middle East	4	Australia (AU)	5	Kazakhstan (KZ)	1	Spain (SP)	7
North Africa	3	Austria (AS)	2	Korea (KO)	6	Sweden (SW)	1
Africa	3	Barhain (BA)	1	Korea - North (NK)	2	Taiwan (TW)	1
Asia	25	Brazil (BR)	6	Korea - South (KO)	1	Turkey (TU)	2
Australia / Océania	9	Canada (CA)	15	Marocco (MO)	1	United Kingdom (UK)	8
		Chile (CE)	16	Mexico (MX)	1	Uruguay (UR)	1
<b>Maritime Zone:</b>	<b>18</b>	China (CH)	4	Mozambic (MB)	1	USA (US)	131
Atlantic Ocean	10	Egypt (EG)	1	New Zealand (NZ)	4	Venezuela (VZ)	1
Pacific Océan	5	Finland (FL)	4	Norway (NO)	1	Yougoslavia (YU)	1
North Sea	2	France (FR)	21	Peru (PE)	3		
Channel	1	Germany (GE)	3	Philippines (PH)	1		
		Greenland (GR)	1	Polande (PL)	1		



Concerning the factor **Ambient illumination** (Factor 6), little less than two third of the 300 cases (175 cases / 59%) have occurred at night and a little more of one third of the cases took place during daytime (115 cases / 38%). The time of the sighting was not mentioned in 10 cases (3%)

En ce qui concerne le facteur **Luminosité** Un peu moins de deux tiers des observations se sont déroulées la nuit et un peu plus d'un tiers de celles-ci ont eu lieu de jour (38% / 115 cas). L'heure de l'observation n'est pas mentionnée dans 10 cas (3%).

**b. Type of aircraft (Factor 8):**

The distribution of the 300 cases by the factor **type of aircraft** gives the following results:

Type of aircraft		
Military aircraft (M)	126 cases	42%
Commercial aircraft (C)	118 cases	39%
Private aircraft (P)	50 cases	17%
Other <sup>4</sup>	6 cases	2%

The number of UAP sightings reported by military pilots and by commercial pilots are closed (difference only of 9 cases). This result has to be taken over regarding the methodology used to select the cases according to the factor source: most of the cases of source 1 (information from official report) are military cases.

In 67 cases (2%), the phenomenon was observed from more than one aircraft in flight.

**c. Testimony: (factors 19 and 20)**

In 208 cases (69%), the witnesses (crew members) were two or more. In 92 cases (31%), the pilot, or the co-pilot, was the only witness.

<sup>4</sup> Observations reported from several aircraft of various type (Military and commercial: 5 cases; Private and Commercial: 1 case)

In 41 cases (14%), ground witnesses have confirmed the sighting of phenomena reported by the pilot and/or crew members.

**d. Type of aircraft propulsion : (factor 9)**

The distribution of the 300 cases according to the type of propulsion is as follows:

Type of aircraft propulsion		
Propliner	145	49%
Jet (and jetliner)	141	47%
Helicopter	4	1%
Unspecified	10	3%

The distribution of cases is almost identical between jet powered aircraft (141 cases) and propeller aircraft (145 cases).

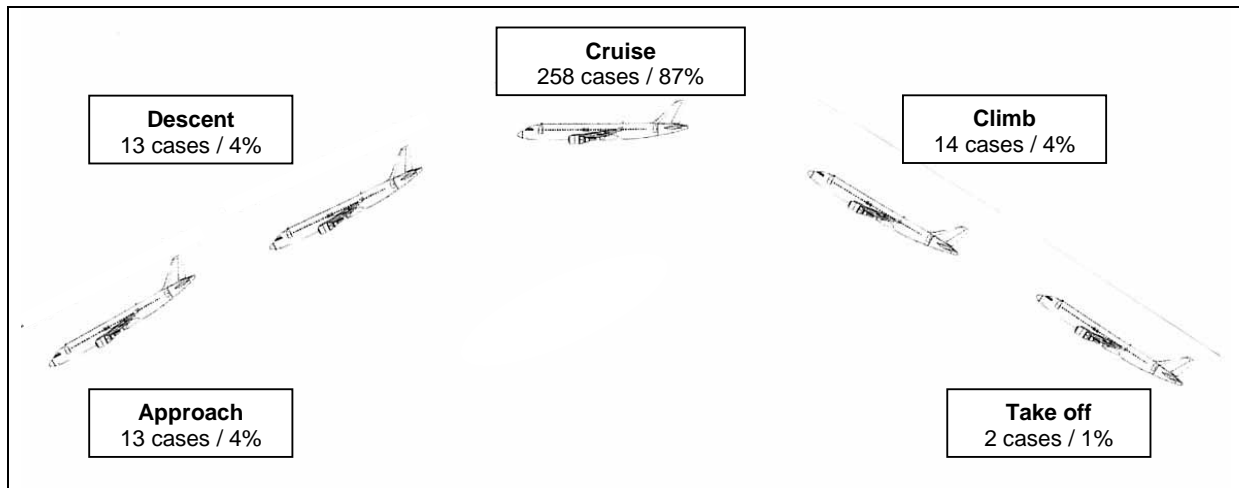
**e. Phase of flight: (factor 10)**

Cases were distributed according to the phase of flight during the sighting. The flight is divided in six phases: Take off, climb, cruise, descent, approach. The results are as follows:

Phase of Flight		
Take off	2 cases	1%
Climb	14 cases	4%
Cruise	258 cases	87%
Descent	13 cases	4%
Approach	13 cases	4%

Distribution of cases according to the phase of flight shows that a large majority of sighting occurred while the aircraft was in cruise flight. It has to be added that during this phase of flight, the pilot has more time to look at the sky as the aircraft is often on autopilot. On the other hand, during the four other phases of flight pilots turn their attention to piloting and to flight instruments.

**Table 2: Distribution des cas selon les phases de vol**



**f. Electro-Magnetic Effects on aircraft systems: (factor 12):**

These are cases in which permanent or transient electro-magnetic (EM) effects occurred on in-flight aircraft systems allegedly as a direct or indirect result of the relatively near presence of one or more unidentified aerial phenomena. Among the 300 selected cases, alleged electro-magnetic effects were noticed and reported in 39 cases (14%)

These 39 cases involving EM effects have occurred more especially at night (26 cases – 66%), almost in all cases during cruise phase of flight (38 cases) and only one case in descent phase, and in two third of the cases (25 cases – 64%) the UAP has performed maneuvers.

The distribution of the 39 EM effects cases according to the type of aircraft shows that military aircraft are more affected, even if many of them are specially shielded against radiation. The distribution is as follows: Military aircraft (16 cases – 41%), private aircraft (13 cases – 33%), commercial planes (10 cases – 26%).

**Table 3: Distribution of cases by affected systems**

Affected Systems	E-M Symptoms	Type of Aircraft	Nb of cases (*)
Radio	Lost all frequencies UHF + VHF (7) Lost UHF (5) Lost VHF(1) Lost intercom (1) Interferences (6)	M(7) P(5) C(3)	15
Magnetic Compass	Needle(s) rotated rapidly and continuously (5) Rapid needle(s) rotation and jamming (1) Aimed toward UAP (2) Two compasses indicating different direction (1)	P(5) M(4) C(1)	9
Aircraft control	Lost altitude (1) Gained altitude (1) Lost control of aircraft (3) Blocked (1) Turbulences when closed to UAPV(1)	P(2) M(3) C(2)	7
ADF** (Automatic Radiocompass)	Two needles oscillate violently (1) Rapid rotation (2) Started not automatically (1) Pulsations (1) Burned (1) Other (1)	C (4) P (3)	7
Power Plant	Engine runs roughly (2) Aircraft experienced buffeting (1) Partial lost of power (1) Engine stopped and restarted « automatically » (2)	P(4) M(1) C(1)	6
Weapon System	Total failure (2) Gun radar failure (2) Anti-jamming failure (2)	M (5)	5
General electrical system	Total failure (radio, lights, ...) (1) Cabin lights extinguished completely (1) Cabin lights dimmed (1)	P (1) C (2)	3
Autopilot system	Failed to operate normally (1)	C (1)	1
DME***	Failed to operate normally (1)	P(1)	1

(\*) In some cases, several systems are affected during the same UAP observation.

(\*\*) ADF: Automatic Direction Finder.

(\*\*\*) DME: Distance Measuring Equipment

Distribution of cases according to the affected system shows that:

- radios and compass (all kind)) are the most affected systems<sup>5</sup>, respectively 15 et 9 cases;
- aircraft control (lost or gained altitude, turbulences, ...) was affected in 8 cases ;
- ADF and propulsion system were affected in six cases;
- Weapon systems were affected in 5 cases;
- General electrical system (cabin lights, landing lights, ...) was affected in 3 cases;
- Autopilot and DME were affected in one cases.

Furthermore, it is important to notice that in 37 cases, EM effects on avionic systems were transient and happened only when the UAP was visually seen by the witnesses.

The above mentioned analysis of EM cases confirmed the specificity of military cases<sup>6</sup> Military aircraft are affected even if they are more specially shielded against radiation than the commercial or private planes. This analysis shows also that in five cases, when pilot have locked on their gun radar and weapon system on the UAP, all systems became ineffective and anti-jamming devices failed to operate normally. In those five cases, a complete check of the affected systems while back at the base has shown no failure or anomaly.

Whatever was or were the nature of UAP the fact that they are capable to make weapon systems ineffective, when the pilot has locked on his gun radar on them, seems to indicate that some of these phenomena use electronic detection or counter-measure systems.

These sightings involving EM effects are of great interest due to the fact that they could possibly give us some technical information on the nature of the phenomena.

#### **g. Physical effects on witnesses (pilot, co-pilot,...): (factor 13)**

“Physical effects” were reported by the witnesses in 5 cases (2%). They are of very different kind. In three cases (9/03/1957, 17/07/1957 et 24/07/1957), passengers were injured when the pilot had to make a rapid evasive action to avoid a collision with the UAP. In another case (05/05/1958), the pilot felt an intense heat inside cockpit when the UAP was at a distance of 900 feet from the aircraft. In the last case (21/10/1978, Australia, Valentich case) pilot and aircraft have disappeared.

#### **h. Radar detection of UAP: (factor 14)**

There are three kinds of Radar-visual (RV) sighting: (1) detection by ground radar (GR), (2) detection by airborne radar (AR), (3) detection by ground radar and airborne radar (AGR). A fourth category (NR) exists when ground control has checked but did not see any target on the radar and could not confirm the visual sighting.

Among the 300 selected cases, radar check (positive or negative) was done in 146 cases (49%) and the results are distributed as follows:

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<sup>5</sup> Confirm résultats obtained in an analysis conducted by NARCAP in 2001 :“A preliminary Study of Sixty-four Pilot Sighting Reports involving Alleged Electro-Magnetic Effects on Aircraft Systems”, NARCAP Technical report n°3, 2001/20), Dr Richard F. Haines and Dominique F. Weinstein ,

<sup>6</sup> This spécificity was stated by the author in « *Phénomènes aérospatiaux non identifiés – Un défi à la science* », book published under the direction of Yves Sillard, cf Chapitre III « Les cas aéronautiques »

Positive radar detection (GR+AR+AGR)	81 cases (27% of 300 cases)
Negative radar detection (NR)	65 cases

In 81 cases (27% of 300 cases), the visual sighting of a UAP was confirmed by a radar detection of it. The distribution of these 81 « Radar-Visual » cases, according to the location of the radar system, gives the following results:

Ground radar	(GR)	46 cases
Airborne radar	(AR)	20 cases
Ground and airborne radar	(AGR)	15 cases

Radar-visual cases are very important and interesting for two reasons: (1) they confirm the visual testimony of the pilot and/or the crew by a technical record of the phenomenon; (2) and sometimes they give technical measures like speed, altitude or trajectory of the UAP.

**i. Type of UAP: (factor 15)**

The phenomena observed by pilots could be classified in two categories: the « lights » and the « objects », when it has a « solid » aspect. The 300 selected cases are distributed as follows:

Object	(OB)	206 cases	(68%)
Light	(LT)	92 cases	(31%)
Unspecified	(UN)	2 cases	(1%)

In more than two third of the cases (68%), UAP reported by pilots and crews are described having a material or solid aspect. UAP described as solid, more often reported as “objects”, have various shapes. The more often reported shapes are circular (or elliptical) with a metal looking surface (sphere, silvery disc, etc...). Meanwhile, numerous other shapes were observed, some of them very strange and opposite to aerodynamic laws.

The 206 cases reported as objects are distributed as follows:

**Table 4: Distribution of cases by shape**

Reported shape (by group)	Nb of cases
1. Circular (14) / Disc (25) / saucer (5) / Round (17)	61
2. Oval (25) / elliptical (1) / egg (2)	28
3. Spheres (15) / balloons (2) / globe (1)	18
4. Cigar (11)	11
5. Missile (5) / rockett (1) / torpedo (1) / fuselage (2)	9
6. Half-sphere (2) / inverted bowl (3) / half-moon (1)	6
7. Triangle (3) / Delta (1) / flying wing (1)	5
8. Cylindrical	5
9. Bullet	3
10. Bell	2
11. Cône	2
12. Rectangle	2
13. Changing (UAP shape changed during observation)	1
14. Miscellaneous (*)	13
15. Unspecified	39

(\*) Crescent, hexagon, losange, diamond, inverted V, doughnut, pan-pie, sausage, dark mass, mushroom, pear, tube, elongated.

Circular shape (disc, saucer, round) is the more frequently reported (61 cases). Other shapes are distributed as follows: oval (28 cases), spherical (18 cases), cigar-shaped (11 cases) and missile-type (9 cases). Oval-shaped and cigar-shaped objects could be considered circular shaped objects seen on a different angle (as a disc shaped object slightly sloping). If we add cases describing circular, oval and cigar shaped objects, we obtain a total of 100 cases among the 206 described as objects.

**j. Number of UAP: (factor 18)**

In more than two third of the 300 selected cases (234 cases - 78%) the witnesses have reported only one UAP. In 66 cases (22%), pilots have reported the sighting two or more UAP<sup>7</sup>. In four cases, groups of more than 20 UAP were observed in the same time.

These 66 cases of multiple UAP sightings are distributed as follows: Two UAP (24 cases); three UAP (15 cases); four UAP (7 cases) ; five UAP (5 cases) ; six UAP (1 case) ; seven UAP (3 cases) ; eight UAP (2 cases) ; nine UAP (3 cases) ; ten to nineteen (8 cases) ; twenty UAP and more (4 cases).

**k. UAP behavior – « Vallée classification » (factor 16)**

Using the classification created by par Jacques Vallée<sup>8</sup>, adapted to AIRPANC Database, the UAP behavior could be divided in three categories: (1) Stationary UAP (one light or one object appearing motionless), (2) Phenomena following a uniform/constant trajectory and/or a speed, (3) Phenomena with a variable trajectory and/or speed (UAP performing various maneuvers). The application of the Vallée Classification to the 300 selected cases gives the following results :

Anomaly (AN)	23 cases (8%)
Flyby (FB)	122 cases (41%)
Maneuver (MA)	155 cases (51%)

This classification enables us to set the “level of strangeness” of the phenomenon. Maneuver cases have the highest level of strangeness. They are the most numerous and represent a little more than half (51%) of the 300 selected cases.

**l. Interaction between the UAP and the aircraft: (factor 17)**

“Interaction” cases are the cases in which the UAP seems to react to aircraft presence. In 106 cases (35%), there are interactions between UAP and aircraft. These cases concern these events: (1) UAP performs maneuvers to approach, to chase or to escape the aircraft, (2) dogfight with military aircraft, (3) UAP circles the aircraft or perform maneuvers close to aircraft. The cases in which alleged electromagnetic effects on aircraft systems were reported, belong to this category. These 106 cases were distributed as follows:

Military:	50 cases
Commercial :	27 cases

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<sup>7</sup> Une étude sur les observations de PAN multiple a été réalisée par le Dr Richard F. Haines, directeur scientifique du NARCAP, en 1994 : « *Project Delta: A study of multiple UFOs* », publiée par LDA Press

<sup>8</sup> Scientifique franco-américain, astrophysicien et pionnier d’Internet, le Dr Jacques Vallée étudie les PAN depuis près de quarante ans. Il a été à de nombreuses reprises consulté sur ce sujet par des agences gouvernementales américaines et d’autres pays. Il est également membre du bureau scientifique du NARCAP et du collège d’experts du GEIPAN.

Private : 25 cases  
 Commercial and military: 3 cases  
 Commercial and private 1 cases

The above mentioned results confirm those published in 2008 in the book « *Phénomènes Aérospatiaux Non-identifiés : un défi à la science* »<sup>9</sup>

Factors « behavior » and « interaction » are connected, 96 « interaction » cases are also « maneuvers » cases. These cases are those with the highest level of strangeness..

**m. Impact on Aviation safety:**

The whole UAP sightings reported by pilots and crews could be considered as having an impact on aviation safety, only because they attracted their attention and could distract them from their task. Meanwhile, some cases have had a real impact on aviation safety (near-collision, collision course, trajectory deviation, maneuvers to avoid collision). In a few cases, the pilots were forced to make evasive actions, sometimes abruptly, and passengers or crew members were injured.

In some cases, electro-magnetic, or other effects, on aircraft systems were reported when the UAP was close to the plane. For many cases, pilots have estimated that the impact on the flight safety was highly enough to submit an Airmis/Airprox report.

In 122 cases (41% of the 300 selected cases), a possible impact on aviation safety was noted. The various events which have had an impact on aviation safety are distributed as follows. Les différents événements, ayant pu avoir des conséquences sur la sécurité du vol se répartissent comme suit :

**Table 4: Distribution by the type of impact on flight safety**

Events with possible impact on flight safety	Nb of cases (*)
1. UAP approach aircraft	33
2. UAP approach aircraft on a collision course	34
3. UAP crosses aircraft's flight path	20
4. UAP circles aircraft and/or maneuvers close to aircraft	18
5. Near-collision with UAP	3
6. UAP chases aircraft	4
7. Pilot has to make an evasive action to avoid collision	24
8. Passengers injured following an evasive action	3
9. Electro-magnetic effects (or other) on avionics systems	34
10. Aircraft and pilot disappearance	1(**)

(\*) In each case, several events could occur simultaneously.

(\*\*) Valentich Case

In 34 cases, the phenomenon has approached the aircraft on a collision course and in three more cases, there was a quasi-collision with the aircraft. In 24 cases, the pilot was forced to take an evasive action to avoid a collision with the UAP, including three cases in which passengers were injured during the maneuver.

<sup>9</sup> Unidentified Aerial Phenomena: A challenge to science, Chapter III by Dominique Weinstein, collective book written under the leadership of Yves Sillard, 2007, Cherche-midi editor.

The impact on aviation safety impact justified itself that aviation authorities had to take seriously into account this factor which should not be neglected. The number (28 cases) of official reports of Airprox, Airmiss or Incident is relatively small due to the difficulty and/or reluctance of the pilots and crews, more especially commercial pilots, to report them officially

## **Conclusion**

This preliminary study of 300 UAP cases reported by civilian and military pilots has shown a number of key points.

- The distribution of cases on the whole Earth (Continental and maritime zones);
- There is more nocturnal cases than daylight cases (two third);
- Witnesses were two or more in two third of the cases;
- Most of the sightings occurred during cruise phase of flight ;
- Electro-magnetic effects were reported in 14% of the 300 cases, radio and compass systems were the more affected;
- Military aircraft are more affected by the E-M effects allegedly caused by UAP;
- Weapon systems were momentarily ineffective when activated towards UAP;
- Visual sightings are confirmed by radar detection in 27% of the cases;
- More UAP are described as « objects » (69%) than lights. Circular (disc) is the most reported shape (58%).
- UAP perform maneuvers in more than half of the cases (51%) and their behaviour seem in interaction with the aircraft in 36% of the 300 cases;
- In 41% of the 300 cases, UAP have had an impact on flight safety, including 24 cases in which pilots had to make an evasive action to avoid a collision with UAP.

This analysis confirms the potential impact on aviation safety and the need of a serious study of these phenomena. Pilots have to be informed on these phenomena and incited to report them on detail basis. In too many cases, basic data, such as time of sighting, distance aircraft-UAP, altitude are missing in reports.

Only a systematic collection of detailed testimonies from pilots and crew will enhance the scientific research on these phenomena and will contribute to aviation safety.

## **Outlook**

This preliminary study is a first step. Radar-visual, Electro-magnetic cases and cases with an impact on flight safety should be studied more in-depth. Furthermore, an analysis on a larger selection of cases, 500 cases or more, should be realised.