



Defense Intelligence Reference Document

Acquisition Threat Support

11 March 2010

ICOD: 1 December 2009

Anomalous Acute and Subacute Field Effects on Human Biological Tissues

Anomalous Acute and Subacute Field Effects on Human Biological Tissues

Prepared by:

**Acquisition Support Division (DWO-3)
Defense Warning Office
Directorate for Analysis
Defense Intelligence Agency**

Author:

AAP Person 81

Administrative Note

COPYRIGHT WARNING: Further dissemination of the photographs in this publication is not authorized.

This product is one in a series of advanced technology reports produced in FY 2009 under the Defense Intelligence Agency, Defense Warning Office's Advanced Aerospace Weapon System Applications (AAWSA) Program. Comments or questions pertaining to this document should be addressed to AAP Person 1 AAWSA Program Manager, Defense Intelligence Agency, ATTN: CLAR/DWO-3, Bldg 6000, Washington, DC 20340-5100.

Contents

Preface and Summary	v
Preface.....	v
Summary.....	v
Chapter One: Definition of Topic and Domain of this Study	1
A. What is addressed in this review	1
B. What is not addressed in this review	1
Chapter Two: Background: What is Thought to Cause Harm?	2
A. Setting the Stage: What others have said openly about injury caused by EMR Field Effects	2
B. Newly Unclassified Material	3
C. Field effects and hearing / communications.....	5
D. Relationships of Physics and Biophysics to Injuries.....	7
Chapter Three: How Damage Occurs	8
A. The effects that burn.....	9
B. The enigma of “non-thermal” wheals and localized “burns”	11
C. Some thoughts on neurological correlates	12
Chapter Four: Applicable Subacute Injury Effects	13
Chapter Five: Cognitive and Neural Injury Mechanisms and Effects	16
References & Working Data Bases	19
Appendix A: Schuessler Catalog of UFO-Related Human Physiological Effects (Frequency Distribution).....	23
Appendix B: Green/Morris Example to Show the Global Breadth of Available Older ICD Case Inputs From Multiple Data Sources (red =pending ICD classification) ..	25
Appendix C.....	27

Figures

Figure 1. Variation of Normalised Specific Absorption Rate with Frequency and Related Absorption Characteristics in Living Organisms.....	9
Figure 2. Electromagnetic Spectrum.....	14

Tables

(U) Table 1: Limits for Maximum Permissible Exposure.....	15
--	-----------

Error! Bookmark not defined.

Anomalous Acute and Subacute Field Effects on Human Biological Tissues

Preface and Summary

PREFACE

Several years ago three previous fit and active individuals experienced an anomalous [“irregular, incongruous and inconsistent with their domain”] aerospace-related event. Within 72 hours they suffered medical signs and symptoms [acute and subacute effects].

- These included almost immediate erythema (heat and redness) over exposed [to the presumed source of an electromagnetic radiation] skin, and varying degrees of the following as a function of their body-surface exposure times: fever, pain, headaches, numbness and parasthesiae, malaise, diarrhea, loss of hair and alopecia, skin eruptions/boils, cardiac palpitations, beginnings of what were to become chronic headaches and symptoms of insomnia and other sleep and dream disturbances, moderate to occasional severe anxiety and insomnia. Two of the persons also experienced photophobia (extreme sensitivity to light), dry and scratchy-stinging eyes, and extreme inflamed blood-shot sclerae (whites of the eyes) with soft tissue swelling of the eyelids. One of the three experienced moderate blood dyscrasia and signs of radiation illness, and over several years developed signs of malignant transformations.

Extensive, but controversial investigations revealed the three had been subjected to an accidental exposure in the near-field [meters] to a broad-band ultrahigh radiofrequency mixed radiation of RF (radio frequency), NIEMR (non-ionizing electromagnetic radiation) & microwave energies [including non-specific and un-measured induced ionizing effects, probably mixed UVA, UVB and UVC (Ultra Violet A, B, C)] centered at about 785 MHz.

- These three persons were antennae engineers subjected to an anomalous “accident” [1]

An extensive review of the medical literature and a compilation of a database has revealed an additional relevant but less dramatic 42 cases from the peer-reviewed medical literature, and an additional un-published similar 300 cases, primarily when fields were measured or emitters were known of mixed exposures of from 1 –10 GHz at power densities of above 100 mW/cm².

SUMMARY

This paper relates, summarizes, and analyzes evidence of unintended injury to human observers by anomalous advanced aerospace systems. Additionally, an argument is made that the subsequent work can inform (e.g., reverse engineer), through clinical diagnoses, certain physical characteristics of possible future advanced aerospace systems from unknown provenance that may be a threat to United States interests.

The evidence discussed includes scientific material that has been peer-reviewed, contained in recently declassified government documents, and early emergent clinical medical analyses also underway in companion research studies.

- Based on historical cases, humans have been found to have been injured from exposures to anomalous vehicles, especially airborne, and when in relatively close proximity.
- The primary mechanisms of injury are related to electromagnetic radiation field effects (EMR field effects).
- The biophysical characteristics of the injuries are well understood.
- The energy related propulsion systems are not well understood.
- The potential deployment of systems is thus important to understand.
- Sufficient incidents/accidents have been accurately reported, and medical data acquired, as to support a hypothesis that some advanced systems are already deployed, and opaque to full US understanding.
- Amongst the most important pathophysiological effects are:
 - Heating and burn injuries
 - Ionizing and non-ionizing
 - Thermally induced
 - Neurological effects
 - Cognitive / central nervous system
 - Neuromuscular / central & autonomic nervous systems
 - Sensory / peripheral nervous system
 - Neuropsychiatric / neuroendocrine
 - Auditory / cranial nerves VII & VIII
 - Communication & disabling effects
 - Noise and central neurocognitive
- Analysis of clinical diagnostic codes together with environmental conditions observed during anomalous events are clustered in meaningful ways.

- The medical analyses while not requiring the invention of an alternative biophysics, do indicate the use of (to us) unconventional and advanced energy systems.

Chapter One: Definition of Topic and Domain of this Study

The objective of the overall program for which this paper has been prepared is to understand the physics and the engineering of advanced aerospace weapons system applications ...into the future, *e.g.*, from now through the year 2050. This study addresses the clinical medical signs and symptoms and biophysics of injury known and expected from unintended exposure to anomalous systems.

A. WHAT IS ADDRESSED IN THIS REVIEW

Advanced aerospace technologies, as with current technologies, often involve exposure of humans to exceptionally strong, and in the future to likely exotic, fields. This review is meant to cover the clinical medical injurious effects, including harmful psychiatric / psychological effects on the human organism that may be induced. Specifically, we are interested both in the more narrow scope of certain near-field heating and burn effects on "biological tissues" [usually human] and also systemic or internal medical / neurological / psychiatric injury or sequelae, usually modulated by neural tissue.

"Near Field" is a term we intentionally leave as subjective. That is, we include effects of possible exposures that are within sight of the injured, and which are acute [within hours] or subacute [within days], but not longer chronic effects. Our working distance from the putative emitter is '10s of meters, and injury times are less than 10 minutes. We thus focus on the acute and subacute high-level, not chronic low-level exposures and effects. The most important bandwidth of interest is the range with tissue effects on humans: from about 300 kHz to 300 GHz; that is, from about 1 km to 1 mm wave lengths.

In particular, we note that many of the effects on tissues {as currently with all environmental exposures of Non-Ionizing Electromagnetic Radiation (NIEMR), toxic effluents, and noise / thermal effects} are initially incorrectly adduced to be "subclinical" until chronic effects of low-level effects and/or accumulative doses are recognized. We will be particularly cognizant to not miss this subtlety in determining harm to persons in the near-field of possible advanced aerospace systems. We will not (except by reference) discuss ionizing radiation tissue effects, unless they are adduced to be "Mixed Field", *e.g.* the Cash-Landrum case, *vide infra*).

Therefore, since the potential deployment of advanced weapons technology is subsumed under this topic, of interest are not only side effects associated with possible lift/propulsion field mechanisms of advanced craft architectures, but also effects from advanced weapons systems as well. These include but are not limited to beam weapons, and active denial systems (ADS), including high powered microwaves (HPM).

B. WHAT IS NOT ADDRESSED IN THIS REVIEW

We are aware of claims that some new and emergent systems may be intended to cause harm, and thus even be an *intended* weapon system. We make no attempt herein to validate any claims. There is ample precedent in US history for utilizing a separate analytic framework for Verification and Compliance issues, as in the lag in our recognizing Former Soviet Union and Chinese systems utilizing infrasonic, laser-blinding, and NIEMR weapons that went unappreciated by our intelligence agencies for two decades. Historically, the IC (Intelligence Community) adduces verification first,

claims of injury secondly, and compliance after lengthy state-sponsored discursive. We will not make that mistake. Beyond this, from a sociological perspective, expansion of this theme may also include the effects on humans *en masse*, namely inducement of hysteria, alteration or solidification of belief systems, alteration/destruction of social structures, group dynamics, etc., the analyses of which would require expertise in a great number of fields including sociology, anthropology, psychology, etc.

This review will not critically evaluate epidemiological infectious disease or low-level electromagnetic radiation / RF aspects of certain exposures, except in passing.ⁱ We will not address psychophysics, paranormal, explicit pre-existing or chronic psychiatric, or abnormal psychological effects from exposures. {However, in the early draft of ICD-Code project in Appendix C, psychiatric diagnostic codes when made by a qualified physician, and medical sequelae from perceived abductions are included for completeness.}

Chapter Two: Background: What is Thought to Cause Harm?

It is well-understood that long-term exposure to even chronic "low-strength" as well as acute "high-strength" electromagnetic fields, ionizing radiation, intense lasers, etc., can have harmful effects on human physiology. {Terms defined *vide infra*} It is also known that EMR mechanisms can disrupt physiological and psychological functioning on a temporary basis. Emerging data support that some of the chronic low-level effects alter the ability of cells to function properly due to epigenetic effects {damage to the DNA / RNA protein regulatory pathways, independent of chromosome disruption}, and simultaneously alter the metabolism of dividing cells of (especially) the neuroimmune system [5,6]. The same holds true for exposure to toxic chemical, biological, or nuclear materials.

A. SETTING THE STAGE: WHAT OTHERS HAVE SAID OPENLY ABOUT INJURY CAUSED BY EMR FIELD EFFECTS

There is relatively comprehensive literature on reported deleterious effects from exposure at close ranges to perceived anomalous aircraft of apparent advanced design [2,3,4,7]. Some of the claimed physiological effects include such phenomena as paralysis, electrical shocks, feeling of heat, burns, perception of odors, etc.

Whether such effects are the result of unintended or intended harm to humans is yet to be determined, though evidence for the latter can be inferred in certain cases [8,9]. We will draw on that literature for selected cases, where exposure and emitter data are known or can be inferred, or where injury can be logically related to biophysical parameters.

That is, it is of particular interest in a threat analysis program, regardless of whether anomalous-craft-induced physiological effects of humans are intended or not, to ascertain probable mechanisms, field strengths, etc., involved in the generation of the

ⁱ As an example, the enormous literature on the low-level and chronic exposure effects of ionizing, non-ionizing-UVA, UVB and UVC radiation will not be reviewed here. That literature is summarized well in http://www.cancer.org/docroot/ped/content/ped_1_3x_radiation_exposure

reported physiological effects. It is our contention that characteristics of the fields or mechanisms associated with close encounters with anomalous craft can even sometimes carefully be gleaned from archival records where effects on human physiology have been carefully reported.

This is true because the medical literature of such field effects {although not many related to craft} has been mature for decades, and is rich in peer-reviewed medical reports and papers. There are several professional societies within the Department of Health & Human Services (DHHS), National Science Foundation-National Institutes of Health) (NSF-NIH) domains, including the Centers of Disease Control Epidemiology Intelligence Service (EIS) that follow these effects, and numerous examples will be discussed.

B. NEWLY UNCLASSIFIED MATERIAL

A couple of years ago a citizen, who believed he was being targeted by the United States Government with harassing field effect weapons {edits and highlights below, are the author's}...

"...XXXX walked into an FBI field office with a two-page letter signed by him and addressed to Special Agent YYYY of the United States Secret Service.

{His} letter stated, in part:

'Agents of the U.S. Secret Service, as you already know, have been committing very serious crimes against me and other members of my family for a very long time, and I'm taking more direct action to prevent it from continuing. I am going to get an admissible confession from at least one of your agents one way or the other, and if I don't get what I am demanding from you today, I will use the method of torture described in the attached pages to obtain that confession and to punish the agent for his or her involvement in the illegal acts that your agents have been perpetrating against me and my family.'

After he was arrested, the court found the evidence for the alleged electromagnetic assaults unconvincing.

The district court then held a competency hearing at which [he] testified, inter alia, that the back of a pair of his shoes were vaporized by an electromagnetic weapon fired at his feet in 2001. [He] presented the shoes in question to the district court, but it appeared to the court that the heel of the shoe had simply worn out due to ordinary use.

Inevitably, XXXX's mental status was questioned.

After receiving this report, XXXX requested that he be examined by a medical professional of his own choosing. The psychologist chosen by XXXX concurred with the government's psychiatrist that XXXX "is clearly psychotic and... precisely fits the diagnosis of paranoid schizophrenia" [5-a,b].

The story didn't end, then. It turned out that XXXX may have been crazy, and the Government wasn't harassing him, *but his document was valid*: it was a newly

unclassified US Government document *that described precisely and accurately the nature of the Field Effects* XXXX claimed existed [5].

It was a recent (1998), classified (until 2006) and controlled document: SECRET / NOFORN; Not to be disseminated to US Allies, NATO, or physically even be taken outside the United States except to secure US Embassy Military Attaché Facilities. It was from a unit in the Intelligence and Security Command {INSCOM}, the US Army Analytical Element responsible for coordinated National Intelligence Community Assessments of military threat potentials...based on current known worldwide (including US for benchmarking) research.

It remains a bit murky as to how Mr. XXXX was able to "FOIA" ("use" the Freedom of Information Act) and obtain the document. Other "legitimate" researchers had consistently not been able to obtain it.

The above vignette is offered, to make several points...both administrative and subjective, and scientific... and objective:

- Classified information exists that is highly pertinent to the subject of this study, and only a small part of the classified literature has been released.
- Yet, while directionally indicative of interest and intention to understand, the material does not rise to the quality of the initiative of the program in which this paper serves as one analytical example. ⁱⁱ
- There is no evidence that the systems described in the document have been fielded.
- The development of generators and aiming devices is not a rate-limiting issue. ⁱⁱⁱ
- There is no doubt that they would work.
- The concerns, therefore, that individuals exposed to field effects as described in the document, and in this paper would suffer the claimed injuries...are legitimate.

Amongst the systems described are those of special interest in this effort: claimed injury from near-field exposures to aerospace anomalous vehicles and systems. As will be described, the pattern and circumstances of injury very often belie *nay-sayer* attempts to discredit witnesses, analysts, and those who suffer directly or indirectly from the systems. Even those who are, from time to time, delusional...are not necessarily poor reporters of information outside their particular and personal delusion.

Examples of systems the INSCOM analysis described as real and potential include precisely those asserted by good observers {and victims of injury} consistent with near-field RF / EM / NIEMR / Thermal / Infrasonic / and Coherent light-Laser effects:

ⁱⁱ This author once ran the INSCOM effort from which this FOIA'd document [5] derived, as the Assistant National Intelligence Officer for Science and Technology, and has recently chaired a DIA-sponsored 18-month Update Study at the National Academy of Sciences' NRC, [including classified research] published as "The military application of neuroscience research" [5-c] that encompasses virtually every aspect of the 2006 declassified INSCOM study.

ⁱⁱⁱ An electric field strength of roughly 100 kV/m over a time period of 1 nanosecond is approximately the condition thought to be necessary to produce the desired effect when provided to an overall repetition rate of 15 Hz. Such a field may be developed using a radar- like, high-peak-power pulsed source or an electromagnetic pulse generator operated at 15Hz. These technologies exist today. Aiming devices are currently available. The effective range could be meters, or even hundreds of meters [5].

- Microwave communication / hearing / localized heating
- CO₂ Laser communication / hearing / localized heating
- Ability to instill fear secondary to above, including with use of messaging and RF carrier-wave modulated intra-cranial "voices" through thermoelastic expansion of intracranial spaces at 5 kHz (*vide infra*)
- Ability to direct thermal effects to include directed pain, erythema, and second-degree burns
- Ability to cause frontal-temporal headache with mm waves
- Pulses of RF (e.g. 2450 MHz / 12.4-1.24 MeV UHF 1.0 dm – 1.0 m pressure waves) to disorient and destabilize muscular coordination: at this frequency 40 J/cm and of microsecond duration pulses will cause thermoelastic expansion in brain (as well as the cochlear microphonics for hearing sensation at 0.5-32 micron pulse widths per-pulse thresholds are near 20 J/cm)
- Use of mm waves to instigate cortical surface effects and seizures through delta-wave, EPSP & IPSP (excitatory and inhibitory post-synaptic potentials neocortical neuronal synchronization with high voltage 100 kV/m nanosecond pulsed 15 Hz {ELF}:through stimulation of the hippocampus CA3 pyramidal cells and cells of the pyriform cortex, sustained over 1 – 5 minutes for ictal development for petit mal or grand mal seizures
- Loss of consciousness, muscle spasms, muscle weakness
- Parasthesiae with UHF – SHF, lasting for minutes
- Increase of core body temperature to above 41°C (105.8 °F) with VHF (e.g. 225 MHz) within 15 – 30 minutes {1-2 km waves at dose rates about 10 W/kg; 5 W/kg will increase a humans core body temperature within one to two hours
- Use of pulsed-microwaves to temporarily interfere with short-term spatial memory
- Nausea and vomiting, and disorientation can be easily induced with audible frequencies at 145 dB at selected frequencies of 100-500 Hz, within seconds up to a few minutes: combinations of infrasonic and sonic tones can be selected for specific effects on the vestibular apparatus to induce highly specific gastro intestinal and neural effects.
- ^{iv} (see footnote)

C. FIELD EFFECTS AND HEARING/COMMUNICATIONS

^{iv} The INSCOM document also discusses another area of interest, but one beyond the scope of this review. That is, the effects of laser-radiation including inducement of photophobic and also acoustical-mechanical as well as thermal effects. As our area of focus does not include either actual accidental or anecdotal cases in this domain, we will not review laser-induced field effects.

The Airborne Instruments Laboratory {AIL}^v in 1956, reported for the first time *anecdotal evidence* that persons could "hear" RF frequencies [10]. The data were however, deemed important enough to be placed in a corporate advertisement and warning.

Yet, the first systematic review of evidence and experiment of what is now known to be human capability to "hear" modulations in ears or the temporal lobes, as well as in the apparatus of the inner ear (the "cochlear microphonic") was not published until 1961, followed by a series of eight peer-reviewed papers over the following decade.^{vi}

The most comprehensive review that describes the biophysics and the methodology to modulate RF to incorporate purposive communications, and which also describes in detail injury patterns was published in 2003, by the Motorola Research Laboratories, and is still the seminal meta-analysis {of about 100 review articles} on these subjects [11].

For our purposes, it is sufficient at this point to summarize this and additional literature [esp. 11-15] in contexts narrowly related to claimants' description of effects when placed near (10-100 meters) of a presumed emitting large object, which may or may not have the appearance of containing an obvious RF antenna:

- The mechanism of transduction of the RF may be to or through skin, bone, or the external auditory meatus.
- Frequency and pulse width dependency may account for perceptions as coming from the ear, the temporal lobe on the same or contralateral side to the object.
- The frequencies are amazingly broad: contained with the bandwidth of 2.4 – 10,000 MHz {MF, HF, VHF, UHF, SHF, EHF; wavelengths 1km – 1cm; incident energy densities of 10-20 mJ/kg threshold; 40 µJ/pulse, energy absorption per pulse 16 µJ/g}.
- Thus, the character of the perceived sounds can be used to accurately "back-calculate" the emitter characteristics: many thousands of human experiments over the above ranges have been consistent and repeatable.
- Simple shielding, including tin-foil hats (sic!) will attenuate and often block totally the sounds and communications.

Voice frequencies of 5 kHz-20 kHz can be RF modulated, and transmitted covertly, with intelligible effect. However, it is absolutely required that to hear the sounds, a human must have a capability to hear a frequency acoustic wave in the kHz range above 5kHz through 20 kHz.

^v AIL was formed in 1945, in Mineola NY by then Defense Department contractors affiliated with MIT. It became the forerunner of virtually every subsequent application Radar and EM laboratory, especially for the Department of the Navy. It is known in folklore, as having been the site of the development of the technology for the controversial "Philadelphia Experiment." http://www.stealthskater.com/Documents/AIL_01.doc

^{vi} There are at the present time, over 240,000 peer-reviewed scientific papers on the phenomena of RF hearing and covert communication, with and without engagement of the inner ear, in the medical literature. Yet, to this day, persons who during experiencing of anomalous RF hearing and skin heating when confronted by unknown objects in the near-field are nonetheless ubiquitously {at first, at least} said to be paranoid, or paraphrenic, or paranoid schizophrenic.

That said, it is not necessary that the cochlear microphonic versus ephaptic (electrical current transmissions through the intercellular spaces) modulation of the axons of the VIIth and VIIIth cranial nerves be stimulated directly: the hearing pathways and relay middle geniculate bodies and inferior colliculi may be stimulated by the RF, first. That is: while it is possible for energy transmission or transduction to "bypass" the tympanic membrane, organs of Corti, and cochleae...the hearing apparatus is necessary for at least penultimate stimulation to hear sounds in the voice range: thoughts and meaning can not be otherwise transmitted [12]. But, at the same time, thermoelastic expansion and contraction of fluid spaces in the brain can result in the perception of clicks, buzzing sounds, and humming.

Notably, the above discussion is of non-hazardous "effects." Harm and injury, including severe headache seizures or convulsions, motor ataxia and contractures, unconsciousness, and destabilizing psychiatric acute, subacute, and chronic outcomes can be induced. The use of very high intensity RF pulses at, for example, 915 MHz will cause an elevation in brain temperature of 8 °C, resulting in *petit mal* or *grand mal* seizures after one minute exposure, followed by 5 minutes of unconsciousness.

Recovery occurs when brain temperature returns to within 1°C of normal (37 °C). The threshold for this stun effect is 680 J, regardless of peak power, pulse width, and equates to about 28 kJ in terms of expressed peak absorption. This adverse effect is about 1,000 times higher than the auditory threshold, which in humans is near 16mJ/kg as reported above. No adverse effects, in any event have been found at SARs (Specific Absorbed Rate is a measure of the rate at which energy is absorbed by the body when exposed to radio-frequency electromagnetic field. It is defined as the power absorbed per mass of tissue and has units of watts per kilogram) in the head of 0.2 W/kg (950 MHz) up to 1.0 W/kg (936 & 90 MHz) [13,14].

In summary, the evidence is solid that the military and aerospace industries' own classified, proprietary and unclassified literature, as well as the certain evidence of many aerospace RF-related microwave, antenna-related, high power (HP) microwave, infrasonic / sonic, and thermal (from any source) energy deposition accidents [*vide infra*] is congruent with the anomalous vehicle reports. This means that one can not discount the claimed and often observed injuries as being real-world (although current and likely advanced beyond public information) technologies, and which are causes of these effects and injuries.

D. RELATIONSHIPS OF PHYSICS AND BIOPHYSICS TO INJURIES

To give but one hypothesis with regard to exotic mechanisms, there is the possibility that those are effects predicted by General Relativity Theory that would correlate with some of the reported data in which the blackbody heat spectrum of an object (an anomalous craft) would be blue-shifted (increased in frequency) under conditions of spacetime manipulation for lift and propulsion. Were a human exposed to blue-shifting at relatively close range, symptoms associated with broadband radiation - microwave, visible, UV, soft X-rays - could be expected. [Adapted from *Technical Study 10.0 Human Effects*]

Medical data supports this option. That is, "mixed NIEMR" causes microwave tissue heating, and also disruption of clones of white blood cells to cause cessation of cell division. (Green & Schuessler, unpublished findings of a pair of well-documented human

cases...Cash-Landrum 1987). These cases and all other clinical data in this report are HIPAA – protected.^{vii}

One of the outcomes from exposure to, say, ionizing radiation due to any of the above phenomena is damage to cellular DNA [16]. This hazard is one of the daunting challenges to be met and overcome even when it comes to consideration of such human-oriented activities as spaceflight for extended periods of time [17]. Fortunately, the understanding of DNA structure and mechanisms has progressed to the point that techniques for characterizing DNA are being routinely applied in such civilian applications as crime scene investigations and paternity testing [18].

Chapter Three: How Damage Occurs

The term *radiofrequency* when applied to the electromagnetic spectrum covers the frequency range 100 kHz-300 GHz; the term *microwave* is applied to the frequency range 300 MHz-300 GHz. The range 300 MHz-3 GHz (wavelengths 1 m-10 cm) is termed ultrahigh frequency and includes cellular telephones, television broadcasting, and microwave ovens (2-45 GHz). The range 3 GHz-30 GHz (wavelengths 10 cm-1 cm) is termed super high frequency and includes radar, satellite, and other microwave communication systems.

The effects on humans of ultrahigh frequency and superhigh frequency are primarily those of heating. The rate at which the energy of radiofrequency radiation is absorbed in body tissues is described as the specific absorption rate (SAR) expressed in watts per kilogram (W/kg) and depends on the frequency (Hz) and the power density expressed in watts per square meter (W/m²), which can be described as the power crossing unit area normal to the direction of wave propagation.

An area that is unique, and murky, is that of 60 Hz electric field induced by High Power (HP) generators presenting whole-body irradiation of 1,000 V/m and 5,000 V/m. Healing and rapidly dividing tissues were seen to have growth retarded, and anaplasia and disorganization in connective tissue fibroblasts and otherwise normal cells in the higher, but not the lower fields [19]. The study, part of a large effort by the DOE has been largely ignored: the data for the lower field effects that have created a large bone and tissue – healing industry.

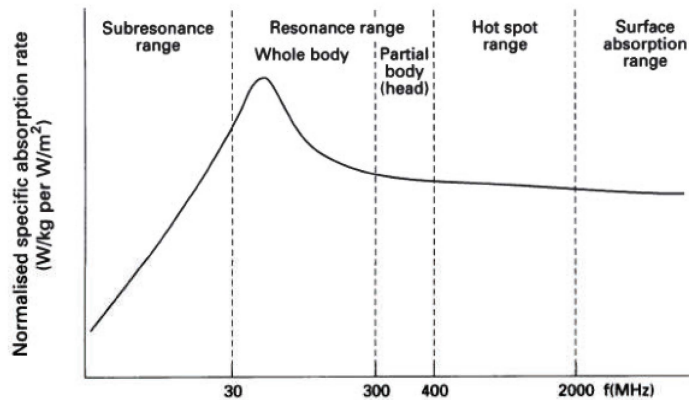
The deposition of radiofrequency energy in body tissues varies with absorption characteristics, which depend to a considerable extent on water content. Tissues such as blood, skin, muscle, brain, and peripheral nerves will absorb much more energy than fat and bone. The result is that much of the incident radiofrequency energy tends to pass through the surface fatty tissue where it is deposited in the deeper tissues such as muscle and brain.

The figure below shows that based on the absorption characteristics of the human body radiofrequency can be subdivided into four regions. The frequency involved in the exposure of the antenna engineers introduced in the preface of this paper (785 MHz) is

^{vii} HIPAA = Health Insurance Portability and Accountability Act, passed in 1996 provides absolute privacy protection for written, electronic, and verbal medical information obtained by health professionals and systems. Additional examples of HIPAA and several hundred cases now being coded for clinical medical diagnoses in a parallel study by the author is underway and described in Appendix C.

the "hotspot" range which lies between 400 MHz and 2 GHz. The heating is highly nonuniform with typical ratios between spatial peaks and whole body average specific absorption rates of the order of 150:1 to 200:1. {above and Figure One adapted from [1]}

Figure One



Variation of normalised specific absorption rate with frequency and related absorption characteristics in living organisms: reproduced with the permission of WHO from: Electromagnetic fields (300 Hz to 300 GHz) 1993:76. (Environmental Health Criteria 137.)

A. THE EFFECTS THAT BURN

From the perspective of aerospace applications, the millimeter wave length of emitters has been of greatest interest for human effects, and there have been extensive reviews documenting effects at both low and high levels of incident energy [20,21]. For our purposes, the most basic biophysical information that pertains is clear: with dry clothing, 90-95 % of the energy is efficiently absorbed with or without an air gap acting as an impedance transformer. These millimeter waves (30-300 GHz) penetrate the skin to a depth of several millimeters. The ANSI (American National Standards Institute) safety guideline of 5 mW/cm² for RF /NIEMR equates to a SAR of 65-357 W/kg.

The depth of penetration involves the area of cutaneous receptors, and at and above these levels will be perceived first, as prickling sensation, then pain and finally erythema and even second degree burns if exposures last on the order of minutes: burning can occur in a non-linear dose-effect range above these SAR levels, as described elsewhere in this paper.

The threshold of heat perception is near 0.7 mW/cm², with power densities of about 9.0 mW/cm² causing sensations of pain within one second of exposure. It is notable, that the non-linear effects apply; e.g. for 3 GHz {decimeter, not millimeter wave lengths}, the thresholds are on the order of 30 times less. Indeed, especially in the Former Soviet Union, there is substantial literature on these wavelengths at SARs below 10s of W/kg (as with Diathermy Machines in the US in the '50s) being exploited for a wide range of external and internal (gastrointestinal) therapies.

Of interest here, in the context of incident RF that can produce heating injury, are a series of very early experiments done at Brooks Air Force Base and the Oak Ridge National Laboratories during the Cold War era intended to study potential weapons and

space application human effects [22,23]. In these experiments low energy proton effects on tissue were observed.^{viii} In these experiments, incident energies were selected for skin surfaces that were very similar to the example of the RF / NIEMR 30 - 300 GHz millimeter wave experiments just described: 1-30 Mev.

The ranges of skin penetration were the same: 0.5 – about 5.0 mm. At the highest doses selected (up to 2000 rads) no clinical effects were noted at or below equivalent Mev – levels found at millimeter waves, SARs of 10 mW/cm².

There have been several studies {encompassing about 100 reported cases during acute accidental exposures in military aerospace and communications situations} that have collected data on human exposures to RF of mixed and broad bandwidths [1,23]. Comparison of this medical literature presents striking overlaps to the claimed clinical injury patterns of several hundred near-field cases of anomalous and hostile events being currently analyzed for a companion study to this, as described in Appendices A, B, & C.

The emergent findings are that in nearly all cases in which exposures are of the order of minutes or longer, including visible indications at distances of 10 meters, similar acute effects are observed. In order of their positive and negative clinical presentation the signs and symptoms [23,24,25,26] include:

- Warming/prickly sensation over exposed glabrous skin
- Sensation of burning, no itching or small myelination injury
- Erythema, which progresses top 2nd-degree burns in 72 hours
- Headache, temporal: effect lasting three weeks
- Dizziness/vertigo, often with nausea/ vomiting at 24-72 hours
- Cardiac palpitations at 48-72 hours
- Neurasthenia and peripheral neuropathy absent fasciculation
- Absent evidence of neuromuscular small fiber disease
- Absent evidence of alpha-motor neuron involvement
- Malaise and low-grade fever, emotional liability
- Severe anxiety with high exposure over 10 or greater minutes^{ix}
- Corneal abrasion due to deoxygenating, "gritty eye syndrome"
- Scleral inflammation and iriditiis, photophobia

^{viii} Spaceflight and possible weapons applications were of great concern, and sources indicate, *that there was concern of reported UFO/Anomalous effects at the time* [24]].

^{ix} "Severe Anxiety" as assessed clinically to require medication and hospitalization is a marker for broadband RF/NIEMR [but not ionizing] radiation exposure greater than about 500 mW/cm², or 5x10³ W/m². Thus, a neurological examination that can separate psychiatric from neuropathic and small nerve fiber damage can serve to demarcate exposure in SAR, and can help distinguish whole body, head, and/or hot-spot surface absorption.

- Beau's lines on fingernails
- Absent serum enzymes and CBC findings
- 30-60 day subacute persistent sleep disorder, dysphagia
- Parasthesiae (can last up to 3 years, and thus become chronic)

It is particularly important to note that one can do a semi-quantitative dose-response determination of apparent anomalous events, by comparing the clinical reports, with what we know from the literature...at least as a first approximation of what one may adduce the power system effects at near field may have been. For example, from the peer-reviewed medical literature one can find cases inclusive of about a dozen patients and subjects exposed to one to ten minutes RF [HF through EHF] (of the '100s mentioned above):

- $<10 \text{ mW/cm}^2$ @ UHF-SHF = no effects [27]
- $>50<100 \text{ mW/cm}^2$ @ UHF-SHF = as above [28]
- $<50 \text{ mW/cm}^2$ (2.45 GHz) UHF-SHF (presumed) radial neuropathy and dyesthesia: 20 months duration, intermittent electromyography changes, multiple sensory neuropathy [25,29]
- $>250 \text{ W/m}^2$ @ HF (20-30 MHz) impaired 2-pt discrimination ^x
- $<1 \text{ mW/cm}^2$ (presumed) @ UHF (2140 MHz) double-blind / cross-over study in adolescents and adults: no neurological or cognitive signs and symptoms [30, and Figure Two *vide infra*]

B. THE ENIGMA OF "NON-THERMAL" WHEELS AND LOCALIZED "BURNS"

An observation made often, in the literature of aerospace related reports of anomalous object after-effects, clinically valid, but not linked to any observed heating effect, is the appearance of what appear to be 1-3 cm localized circumscribed erythematous, occasionally gangrenous, and sub-dermal wheals, boils, and serosanguinous abrasions. These injuries appear concomitantly with what are otherwise felt to be burns from microwave or other RF injuries, except they are often found on clothed parts of the body, at a distance from the worst second degree burns. And, dermatologically, they can't be diagnosed as thermal or RF-related injuries.

A recent publication from the Bogoliubov Laboratory of Theoretical Physics, Joint Institute for Nuclear Research, Dubna and Tashkent Russia; Faculty of Physics, Tashkent; and the Institut für Physik, Rostock, may offer some first notions of an underlying pathophysiological mechanism. The study is said to be theoretical, but based on experimental data, and appears to be unrelated to any emitter concerns, RF or otherwise, and is not linked to an aerospace application, although funded by a

^x Note: the wavelength of this exposure would have been on the order of 10-50 km; in the previous UHF-SHF injuries, they would have been 1 cm - 1 dm; given equal incident energy dermal penetration is inversely proportional to wavelength. A companion study is attempting to further quantify these relationships, to permit additional inferences as to putative energy sources of anomalous events.

prestigious organization known to be interested in field effects. The authors consider the case when the charge carriers are ions in a fluid flowing through a tube. The ions are free to move but obviously confined within a specific volume. The team then poses the question: what happens when you apply a static magnetic field modulated by Johnson Noise (a function of calcium currents in closed tubes, non-linearly dependent on temperature in the presence of ULF).

The answer, they say, is a resonance effect in which the ionic currents grow stronger. The strength of the resonance depends on the size of the capillary and the strength of the field. The authors have worked out how this effect might play out in the human body, and cause stasis under certain conditions and small vessel damage, as a function of the concentration of calcium in the microcirculation. A recent peer-review (well beyond the capabilities of this author) has found the work promising [31].

C. SOME THOUGHTS ON NEUROLOGICAL CORRELATES

From this brief summary it can be seen that not only are incident energies, wavelengths, and durations of exposures independent variables of gross injury, but they also are variables as to tissue type. This might be expected, because the injury to nerve and other cell types must be secondary to alteration of the molecular and biochemical structures. In the case of nerves/neurons in peripheral or central nervous system components, the action potentials and subsequent release of end-plate, ephaptic, or synaptic neurotransmitters are known to be related to the currents induced across the membranes by direct EMF, or induced B-Fields.

The electrophysiology should allow inferences to be made as to incident energies and bandwidths to the extent we can infer or discover the near-field RF qualitative and quantitative measures. *What can not be overly emphasized, is that when one looks at the literature of anomalous cases, including claims from the most reliable sources, the extent and degree of injuries are consistent across patients who are injured, compared to witnesses in the far-field, who are not.*

For example, in the cases this reviewer has studied, the directionality and the times of the known RF / EM exposures and the injury severity and patterns are highly consistent: *There are no significant differences in either the reported acute effects (symptoms) or the physician-observed (signs) between the case of three antenna engineers and the Cash-Landrum cases.*

This pathophysiological observation is a convincing one: "Something" is causing these near field^{xi} injuries, the energy deposition and conditions follow our "real-world" neurological experience. It seems highly unlikely that imagination or delusion of laypersons could mimic the science of thermal injury patterns, electrophysiology, immunology, and neurology in a non-linear dose-response manner...and incorporate the biophysics of wavelength and eV effects ($1 \text{ eV} = 1.6 \times 10^{-19} \text{ joules}$).

^{xi} "Near-Field" as a term in this and companion studies refers to the subjective distance, in part, between the injured patient and the presumptive energy source, be it an RF / EM antenna, source of microwaves, or unidentified object. We use the term also to imply relatively limited spatio-temporal exposures (within 10s of meters), times before acute (minutes to hours to one day) or subacute (up to 72 hours) periods between exposure and signs and symptoms of actual injury. An object, or in this case a human body in the near field where electromagnetic waves are incident yet to be fully formed due to the perturbation. But to first and second orders, inferences and calculations of wavelength and energy depositions can sometimes be made with good reporting and data from the events.

Indeed, there is even a small amount of literature (less than a dozen good peer-reviewed studies) that incorporates these ideas. McRee, Wachtel and associates have studied ionic gradients in nerves, and compared thermal versus non-thermal injury patterns. They have found the effects are independent of each other, and may be due to involvement of the Sodium-Potassium = ATP-ase pump, that subtends the functioning of all excitable tissues [27,32].

A very recent NATO meta-analysis has defined, on the other hand, low-thermal and non-thermal broad band effects in humans that can be induced by "Non-lethal Weapons" [33]. The development of an active denial system (ADS) in the mm-wave region (94 GHz) at a distance of within 100 meters will cause localized heating and discomfort.^{xii} These wavelengths can not penetrate beneath the superficial layers of the skin. They do stimulate localized pain and stimulation of dermal receptors of the lateral spino-thalamic tract...which will afford direct and specific clues in evaluating claims of injury: the receptors for pain, tickle, itch, and prickling sensation are we believe unique to depth and frequency. Pulsed microwave weapons based on HPM (High Power Microwaves) represent another example of a directed energy system. Typical systems operate at 1-3 GHz {UHF-SHF; dm wavelengths}, and can penetrate deep into the human body, and do not generate heat. Several controversial {non-replicated and not to be reviewed here} studies do claim, however, that these frequencies will cause dissolution of the blood-brain-barrier (BBB) integrity, and hence can cause subacute injury. Changes in the cytoskeleton proteins occur only after higher than realistic pulse repetition rates for the US systems under development as weapons.^{xiii}

Chapter Four: Applicable Subacute Injury Effects

There is additional rich and established literature that describes well the subacute level effects of {particularly} radio frequency and microwave fields (MF) on human and animal tissue. (Figure Two)

It should also be mentioned, that beginning in the late '80s [34,35,36] low-level RF, clearly athermal in incident energy, of time varying magnetic fields called PEMF (pulsed electromagnetic fields) of 1-15 HZ, 2-8 Gauss began to be researched clinically for bone-union, pain management, depression alleviation, and dermal cell repair. These ELF multi-kilometer wave-length RF are excluded here, as the literature has shown no injury potential for this bandwidth. That said; numerous reports on both the anomalous event as well as the clinical medical literature describe the occasional "effects" experiencers or patients utilizing such therapy sometimes report.

These effects include occasional mild and localized warmth when touching an object of unknown provenance, or under the electrode: a pleasant mild itch or tickle sensation {non-specific stimulation of paccianian and nociceptive skin receptors served by peripheral un-myelinated nerves} and pleasant cognitive effects and relaxation. Although we can hardly categorize such near-field effects as injuries, we note and catalogue them as non-specific neurological "effects." There is no *a priori* reason to

^{xii} Unfortunately, the NATO study does not contain information on the power density, or the other technical parameters to accomplish the ADS effect.

^{xiii} We are, of course aware, that this series of studies is not to be limited to current technology, much less-only "on-world" technology. A theoretical examination of these claims is thus underway, but is not in-scope for this review.

believe that only injury patterns in the near-field will lead to diagnostics of emanations from unknown emitters related to aerospace objects.

Figure Two http://en.wikipedia.org/wiki/Electromagnetic_spectrum#cite_note-1

CLASS	FREQUENCY	WAVELENGTH	ENERGY
Y	300 EHz	1 pm	1.24 MeV
HX	30 EHz	10 pm	124 keV
SX	3 EHz	100 pm	12.4 keV
SX	300 PHz	1 nm	1.24 keV
EUV	30 PHz	10 nm	124 eV
NUV	3 PHz	100 nm	12.4 eV
NIR	300 THz	1 μm	1.24 eV
MIR	30 THz	10 μm	124 meV
FIR	3 THz	100 μm	12.4 meV
EHF	300 GHz	1 mm	1.24 meV
SHF	30 GHz	1 cm	124 μeV
SHF	3 GHz	1 dm	12.4 μeV
UHF	300 MHz	1 m	1.24 μeV
VHF	30 MHz	10 m	124 neV
HF	3 MHz	100 m	12.4 neV
MF	300 kHz	1 km	1.24 neV
LF	30 kHz	10 km	124 peV
VLF	3 kHz	100 km	12.4 peV
VF/ULF	300 Hz	1 Mm	1.24 peV
SLF	30 Hz	10 Mm	124 feV
ELF	3 Hz	100 Mm	12.4 feV

γ= Gamma Rays

HX= Hard X-Rays

SX= Soft X-Rays

EUV= Extreme
Ultraviolet

NUV= Near Ultraviolet

NIR= Near Infrared

VHF= Very High
Frequency

MIR= Mid Infrared

FIR= Far Infrared

Radio waves

EHF= Extremely High
Frequency

SHF= Super High
Frequency

UHF= Ultra High
Frequency

HF= High Frequency

MF= Medium Frequency

LF= Low Frequency

VLF= Very low Frequency

VF/ULF= Voice Frequency

SLF= Super Low Frequency

ELF= Extremely Low
Frequency

The 2007 "Bioinitiative Report", updated on-line often, is well-peer-viewed, comprehensive, and useful to make the point of relevance for us...indicates that acute effects primarily involve tissue heating from these modalities. However, as with well-over 99% of the medical literature on field effects of RF and NIEMR (Non-ionizing Electromagnetic Radiation), heating isn't the current concern. Rather, it is low-level,

non-thermal, effects, and so much of the current literature is of little relevance for this review [37]. That said, the Standards of the FCC (Federal Communications Commission), WHO (World Health Organization), and other relevant industrial hygiene and safety organizations comprehend the effects {at the high end} of acute exposures. From [37] we see some interesting comments {Table One}

Table 1. LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time [E] ₂ [H] ₂ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842	4.89	(900)*	6
30-300	61.4	0.163	1.0	6
300-1500				6
1500-100000			5	6

*Plane-wave equivalent power density

NOTE: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment, provided these persons *are fully aware of the potential for exposure and can exercise control over their exposure*. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure. In the United States, the FCC enforces limits for both occupational exposures in the workplace and public exposures. The exposure limits are variable according to the frequency in megahertz and the duration of exposure time {6 minutes for occupational and 30 minutes for public exposures}. Table One shows exposure limits for occupational and uncontrolled public access to radiofrequency radiation such as is emitted from AM, FM, television and wireless sources through the air. As an example, 583 microwatts/cm² (μW/cm²) is the public limit for the 875 MHz cell phone wireless frequency and 1000 μW/cm² is the limit for PCS frequencies in the 1800 – 1950 MHz range averaged over 30 minutes.

That is: we understand well that for 6 minutes {the same order of magnitude for which we are interested in and concerned about unintended effects} of anomalous near-field exposures...six minutes at the above levels constitute the point at which {from other unquoted industrial hygiene definitions} for RF & NIEMR tissues heating of less than 0.5 degree C, locally to the dermis, will occur. Thus, when one hears reports that definitive heating and even erythema and later second-degree burns are suffered, one can reasonably infer these levels have been surpassed! [2,4, & Green, 2009 Technical Study 10].

Also, in June, 2007, the WHO ELF (Extremely Low Frequency) Environmental Health Criteria Monograph, EMF Program released its ELF Health Criteria Monograph. In the report, they stated: "*Acute biological effects have been established for exposure to ELF electric and magnetic fields in the frequency range up to 100 kHz that may have adverse consequences on health*. The metric for measurement is specific absorption rate (SAR) and is expressed in watts per kilogram of tissue."

The limit for absorption of radiofrequency radiation is limited to 1.6 W/kg within 1 gram of human tissue. The SAR criteria to be used are specified below and apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. The limits used for

evaluation are based generally on criteria published by the Institute of Electrical and Electronics Engineers, Inc., (IEEE) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1-1992.

These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP)^{xiv}.

(1) FCC Limits for Occupational/Controlled Exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue {defined as a tissue volume in the shape of a cube}. Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over any 10 grams of tissue.

(2) FCC Limits for General Population/Uncontrolled Exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue. Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) [37].

These, then, are the current {highly summarized} internationally accepted scientific standards for acceptance of the levels for acute injury, incorporating the "heating" criteria of acute injury for ELF through MHz bandwidths. In one sentence: *acute injury of early burning is not likely to occur at any bandwidth in narrow or mixed frequencies below about 1.0 W/kg or 1.0 mW/cm² at the low end, over minutes, incident to the human body in the near-field (feet to yards).*

Although low-level and chronic effects are not of special interest to us, a recent review by the American Cancer Society specifies the bandwidths of ELF / RF / Thermal / and Noise effects from "Fields" of interest [38].

Of somewhat greater interest is the SAR versus frequency characteristics from which one can adduce the injuries described in the preface to three antenna engineers, the Cash-Landrum trio, and other cases. {Table Two, [1 p.281]}

Exposure of fibroblasts {cells used as sentinel cells in studies of RF and ionizing radiation damage} to UHF Fields {849 MHz}, at high SAR levels {e.g. 10 W/kg, 1 hr} do not result in any detectable damage. This includes endpoints of cell motility and viability, cell cycle, cell distribution, cellular invasiveness, or cell migration. These results hold even when exposures are extended to one hour per day for three days. [39] Thus, in the Cash-Landrum case...one must assume that the RF and tissue heating, clearly responsible for the erythema and burns, did not cause the cell dyscrasia and subsequent gastrointestinal and malignant transformations; one assumes the cells DNA damage was secondary to ionizing radiation [4,40].

Chapter Five: Cognitive and Neural Injury Mechanisms and Effects

^{xiv} "Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright NCRP, 1986, Bethesda, Maryland 20814."

A good many reports from both the human and the animal literature inform us of the mechanisms by which RF can alter neurochemical processes. These RF effects are not always elucidated as being high-field, or near-field, but in the laboratory they are "real field." Understanding the mechanisms is critical to understanding why some neuro-psychiatric effects, if not "injury" occur in non-specific unclear dose-response patterns: sleep disturbances, prolonged anxiety, acute and chronic headache including migraines, seizures, and sensations of peripheral numbness, tingling, and parasthesiae are reported often by workers near RF emitters that are "safe" and ubiquitously by persons who encounter anomalous aerospace objects.

There are four separate problems, and *four separate approaches to their mitigation* in attempting to analyze the medical literature.

- Much of the literature is with animals, of necessity: humans can not be experimented upon at the levels of incident energy with which we are most interested. *But the experiments are often well-done, and inform us what is occurring at the cellular level, from which we can make reasonable prediction and design of forensic investigations for event investigations.*
- By definition, the RF / EMF / NIEMR bandwidths are huge, as are the wavelengths that may {or may not} penetrate skin and skull to actually impinge upon the cells /neurons to cause putative injury, or sub-clinical effects in psychological and/or psychiatric effects. We have reason to believe in the real-world the emitters are complex, and the frequencies are multiple. *But while there are currently approximately 300,000 discreet science citations on "RF injury and brain" and the good peer-reviewed exemplars number approximately 73, [41] the numbers will admit to a meta-analysis with careful selection; it is clearly possible to determine mechanism of action for discrete experimental condition, and analysis of inter-subject and intra-neurochemical findings should be fruitful.*
- There are often quite different effects, as a function of epidemiological study designs. Most of the effects across thousands of subjects show no injury. *That is to be expected; Research is dominated by low-level dose effects {or not}. We should look for acute, mid-to-high dose experiments in animals, that are peer-reviewed and thus have been replicated, and which can be compared with accidental exposures with humans in terms of frequency / bandwidth and dose to tissue.*
- Sometimes the best research shows contradictory results. *And, examination of the subtle differences can possibly lead to striking and testable hypothesis – generation.*
- There are sufficient behavioral studies in the literature to at least indicate in man and {other} primates what are the lowest broadband mixed frequency levels at which *no* acute effects occur. A seminal study done jointly by Syracuse University and the Armstrong-Brooks USAF Laboratory defined the levels below which standard exposures on the order of minutes did not alter neuropsychiatric test scores, or decision-related scores. Ultra Wide Band (UWB) RF at a pulse repetition rate of 60Hz and a bandwidth of 100 MHz to 1.5 GHz (peak power levels between 250-500 MHz) with peak E-Field strength of 250 kV/m in repeated exposures produced no detectable neuro effects [42].

As the purpose of this paper is to argue that data exists to "reverse engineer" propulsion systems of anomalous aerospace vehicles, independent of origin, based on

biology ... two recent examples will be given. Both are from papers published in tier one medical journals, and both were published in the same month, and both were in the same species {shown to biochemically be a good surrogate for man} utilizing similar application methods in rat brain.

Case One: [43]

Fifteen minutes of a high dose {6W/kg} @ UHF {900 MHz} was applied. Endpoints were measured acutely and sub-acutely, for ten days following a single exposure. Reactivity of the supporting and nutrient cellular matrix (the glia) was seen at two days, and less so at three days post exposure. The injury was of the form of an inflammatory reaction and increased elaboration of new protein {possibly a repair mechanism}. The areas affected were primarily the frontal cortex, and deeper areas of the brain {caudate, putamen, and cerebellum} and cerebellum where the cerebellum is responsible for signal integration.

Case Two: [44]

Ten minutes of a high dose {5W/kg} @ UHF {1439 MHz} was applied. Endpoints were measured acutely. Blood-brain barrier {glial interface} permeability, leukocyte behavior, microcirculatory rate and volume changes, and vessel diameter were observed. There were no effects on these microcirculatory parameters.

These two cases are typical of hundreds this author has reviewed, and while confusing initially, they are actually consistent with observations made in patient examinations of real-world human cases:

- Contact {exceptionally near-field} effects at these frequencies negate any conclusions as to wave-length effect: coupling may not occur in a "traditional" sense of induced current or voltage causing cell transport effects.
- Generalized heating does occur, which dissipates over 48 hours. This is consistent with human effects, and could mean that near field effects of EM of propulsion systems at cm distances from the brain are served by the same mechanism of surface heating. Also, the decrease {not absence} in neurological effects in 72 hours, as reported frequently, may be supported by these animal experiments.
- The inflammatory reaction is not the result of increased microcirculation, and this also may explain the paucity of data in human cases for acute and subacute evidence for brain edema.
- One can hypothesize that in humans signs of erythema, but lack of overt burns and blisters, presence of cognitive clouding for 48 hours {relative frontal cortical sensitivity} and prolonged generalized sleep and anxiety complaints {but not respiratory, hypertensive, or other deep nuclei other than caudate and putamen} and muscle fasciculation's and minor parasthesiae and motor coordination {cerebellar} are consistent with the animal studies at UHF.
- The chronicity of neuropsychiatric and paucity of acute neurological signs continue support of the hypothesis of a [relatively!] narrow HF through EHF, non-ionizing, RF band of exposure.

For completeness, we must mention that low-level, chronic {in excess of hours} exposure to low levels of RF {on the order of 0.1 – 1.0 W/kg} has shown a plethora of biological *effects* especially in animal studies, and mostly dealing with a neurochemical endpoint [such as mentioned above with neuro-transmitter protein elaboration]. It is of great interest, in the absence of *injury per se* that in the brain, differences can be found of measured SARs even millimeters apart. [45] Evidence exists that, therefore, measureable effects of as yet unknown importance exist. This data is complex, incontrovertible, and may be of later interest for us in evaluating neuropsychiatric and neurological claims of long-term chronic, low-level, or even “off-world” exposures to high magnetic fields, rotating RF fields, and unconventional equipment.

No effects, however, in fluorescein, sucrose transport, peroxidase permeability, or blood flow has been seen at acute SARs of 2.5 W/kg from 2450 MHz at 10 mW/cm². But, for 1200 MHz at a SAR of 1.0W/kg, pulsed waves at 0.2 mW/cm² or continuous wave for 30 minutes, permeability of the BBB does occur [46].

References & Working Data Bases

[1] C.J. Shilling, “Effects of acute exposure to ultrahigh radiofrequency radiation on three antenna engineers” *Occup. Environ. Med* 1997;54;281-284

[2] J. Schuessler, *UFO-Related Human Physiological Effects* (Geo Graphics Printing Co., La Porte, TX, 1996).

[3] P. A. Sturrock, “Physical evidence related to UFO reports: The Proceedings of a workshop held at Pocantico Conference Center, Tarrytown, NY, Sept. 29 – Oct. 4, 1998, : *Jour. Sci. Exploration* 22, pp. 179-229 (1998). The results of this workshop were later published in detail in book form, P. A. Sturrock, *The UFO Enigma* (Warner Books, New York, 2000).

[4] J. F. Schuessler, “Cash-Landrum Radiation Case,” *MUFON UFO Jour.* 165, p. 3 (November 1981).

[5] Addendum to *Nonlethal Technologies – Worldwide (NGIC-1147-101-98): “Bioeffects of Selected Nonlethal Weapons,”* Army INSCOM (Intelligence and Security Command) Report (1998).

[5-a] <http://www.wired.com/dangerroom/2008/03/shoe-zapping-ra/>

[5-b] http://127.0.0.1:4664/cache?event_id=135227&schema_id=8&q=Bioengineering

[5-c] <http://www.thebulletin.org/web-edition/roundtables/the-military-application-of-neuroscience-research#rt4022>

[6] J. Alexander, *Future War: Non-lethal Weapons in Twenty-First-Century Warfare* (Thomas Dunne Books, New York, 1999).

[7] J. McCampbell, “Effects of UFOs upon people,” in H. Evans and J. Spencer, *UFOs 1947-1987, the 40-Year Search for an Explanation* (Fortean Times, London, 1987).

- [8] J. Vallee, *Confrontations* (Ballantine Books, New York, 1990).
- [9] A partial summary of official Brazilian Air Force documentation concerning a months-long series of close-range, well-documented observations of anomalous craft at Colares in 1977, which includes description of a number of medical injuries, is available at the website: <http://www.ufologie.net/htm/colaresgevaerd01.htm>.
- [10] Airborne Instruments Laboratory 1956 *An observation on the detection by the ear of microwave signals* Proc IRE 44:2A
- [11] Elder JA & Chou CK 2003 *Auditory response to Pulsed Radiofrequency Energy* Bioelectromagnetics Supplement 6:S162-S173
- [12] Green C. 2009 & 1983 {Unpublished Personal Archives}
- [13] Guy AW & Chou CK 1982 *Effects of High Intensity microwave pulse exposure of rat brain* Radio Science 17(5S):169S-178S
- [14] Marino C. et.al. 2000 *Effects of microwaves (900 MHz) on the cochlear receptor: Exposure systems and preliminary results* Radiat Environ Biophys 39:141-147
- [15] Kanokov Z. et.al. 2006 *On the Influence of Weak Magnetic and Electrical Fields on the Fluctuations of Ionic Electric Currents in Blood Circulation* {Deutsche Forschungsgemeinschaft DFG 436 RUS 113/705/0-3}
- [16] http://en.wikipedia.org/wiki/Ionizing_radiation
- [17] D. Bushnell, "Imaginable technologies for human missions to Mars," *Aerospace America* (June 2007), p. 24.
- [18] J. Butler, *Forensic DNA Typing: Biology, Technology, and Genetics of STR Markers - 2nd Edition* (Academic Press, New York, 2005).
- [19] Marino AA, et.al. 1979 *Power Frequency Electric Fields and Biological Stress: A Cause and Effect Relationship* Biol. Effects of ELF: 18th Hanford Con pps 258-276
- [20] Ryan KL et. al. 2000 *Radio frequency radiation of millimeter wave length: potential occupational safety issues relating to surface heating* Health Physics 78:170-81
- [21] Gandhi O & Riaz I 1986 *Absorption of millimeter waves by human beings and its biological implications* Microwave Theory and Techniques, 34(2) 228-235 IEEE Transactions Feb.
- [22] Siegel AM, et. al. 1969 *Some biological effects of Low-energy protons on Skin* Radiation Research 37:323-333
- [23] Graham RB 1985 *The medical records of human exposure to radiofrequency radiation*. In: The impact of proposed radiofrequency radiation standards on military operations *Advisory Group for Aerospace Research and Development (AGARD) 6-16-8 Lecture Series No. 138*
- [24] Green C. 2009 & 1978 {Unpublished Personal Archives}

- [25] Machiori PE *et.al.* 1995 *Acute multiple mononeuropathy after accidental exposure to oven microwaves* *Occup. Med* 45:276-7
- [26] Hocking B *et.al.* 1988 *Assessment of Health after radio-frequency radiation accident* *J. Microwave Power and electromagnetic energy* 23:67-74
- [27] McRee DI & Wachtel H 1986 *Elimination of microwave effects on the vitality of nerves after blockage of active transport* *Radiat Res* 108:260-8
- [28] Forman SA *et.al.* 1982 *Psychological symptoms and intermittent hypertension following acute microwave exposure*
- [29] Wayne L *et.al.* 1984 *Investigation of an active microwave – hand oven injury* *J. Hand Surgery* 9A:132-5
- [30] Riddervold IS *et. al.* 2008 *Cognitive function and symptoms in adults and adolescents in relation to RF radiation from UMTS base stations* *Bioelectromagnetics* 29:257-67
- [31] arxiv.org/abs/0904.1198 2009 *On the Influence of Weak Magnetic and Electric Fields on the Fluctuations of Ionic Electric Currents in Blood Circulation*
- [32] McRee DI & Wachtel H 1982 *Pulse Microwave effects on nerve vitality* *Radiat Res* 91:212-8
- [33] Risling M 2009 *Detailed Examples of Radio Frequency, Kinetic Energy, and Electro-Muscular Devices: a Meta Review* NATO RTO-EN-HFM-145: 2-1—2-7
- [34] Bassett CA 1989 *Fundamental and practical aspects of therapeutic uses of pulsed electromagnetic fields* *Crit Rev Biomed Eng* 17(5): 415-529
- [35] PEMF current human effect literature Green C. 2009; 2,920 citations <http://scholar.google.cn/scholar?q=PEMFs&hl=en&lr=&btnG=Search>; 255 citations <http://www.ncbi.nlm.nih.gov/sites/entrez>
- [36] Loo CK *et. al* 2003 *High (15 HZ) and low (1 HZ) frequency transcranial stimulation have different acute effects on regional cerebral blood flow in depressed patients* *Psychol Med* 6:997-1--6
- [37] C.F. Blackman, *et.al.* 2007 <http://www.bioinitiative.org/report/index.htm> The BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Fields (ELF and RF)
- [38] American Cancer Society *Radiation Exposures* May, 2009 http://www.cancer.org/docroot/ped/content/ped_1_3x_radiation_exposure_and_cancer.asp
- [39] Lee JJ, *et. al.* 2008 *Acute Radiofrequency irradiation does not affect cell cycle, migration, and invasion* *Bioelectromagnetics* Dec. 29(8):615-25
- [40] Green, CC 2001, 2009 Unpublished HIPPA files
- [41] RF Injury and Brain literature Green C. 2009 8,006 citations

http://scholar.google.cn/scholar?as_q=RF+Brain+injury&num=10&btnG=Search+Scholar&as_epq=&as_oq=&as_eq=&as_occt=any&as_sauthors=&as_publication=&as_ylo=&as_yhi=&as_allsubj=all&hl=en&lr=&newwindow=1 73 citations
<http://www.ncbi.nlm.nih.gov/sites/entrez>

[42] Sherry, CJ *et.al.* 1995 *Lack of Behavioral Effects after exposure to ultra wide-band electromagnetic radiation in the microwave frequency range* Radiation Research 143(1) 93-97

[43] Brillaud E *et. al.* 2007 *Effect of an acute 900 MHz GSM exposure on glia in the rat brain: a time-dependent study* Toxicology 238(1):23-33

[44] Masuda H. *et.al.* 2007 *Effects of acute exposure to a 1439 MHz electromagnetic field on the microcirculatory parameters in rat brain* In Vivo 21(4):555-62

[45] Lai, H 1998 *Neurological effects of radiofrequency electromagnetic radiation* Workshop on Biological and health effects of RF electromagnetic fields
www.mapcruzin.com

[46] Lai, H 1997 *Neurological Effects of radiofrequency electromagnetic radiation relating to Wireless Communication Technology* www.mapcruzin.com

[47] About the International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) <http://www.cdc.gov/nchs/about/otheract/icd9/abtcd10.htm>

[48] Vallee Classification System <http://www.yawp.com/3rd-i/rsrc/gloss/v/vallee.html>

[49] Definition of HIPAA
<http://www.medterms.com/script/main/art.asp?articlekey=31785>

Appendix A: Schuessler Catalog of UFO-Related Human Physiological Effects (Frequency Distribution)

The Schuessler catalog, *UFO-Related Human Physiological Effects*, was compiled in 1996 by MUFON's past Director, John F. Schuessler. Covering the time period 1873 – 1994, the catalog comprises a summary of 356 selected cases of UFO-induced physiological effects on humans during close encounters. Physiological effects enumerated include such phenomena as paralysis, electrical shocks, feeling of heat, burns, perception of odors, etc. A compilation of the frequency distribution of these effects is enumerated below. The catalog thus constitutes a useful data base from which it is anticipated that certain physical source causes may be inferred.

Table of Effects Frequency

• Apparent abductions	129
• Electromagnetic effects on vehicle(s)	77
• Paralysis	75
• Perceived time loss	75
• Light beam effects	61
• Eye injuries (e.g., temporary blindness, conjunctivitis)	54
• Heat	43
• Medical exam	42
• Burns	41
• Unconsciousness	33
• Marks left on body	33
• Significant sound effects (e.g., humming)	27
• Electrical shock	23
• Physiological/emotional shock, intense fear	23
• Prickling, tingling sensations	22
• Pain	22
• Skin sores, rash	18
• Induced headaches, migraines	18
• Force field impact	18
• Nausea, vomiting	17
• Sensation of cold	16
• Disorientation, confusion	14
• Ground traces	10
• Weakness, fatigue	9
• Amnesia	9
• Apparent experience of telepathy	9
• Numbness	8
• Significant odors	8
• Voice loss	7
• Appetite loss	7
• Insomnia	7
• Perceived time suspension	7
• Dehydration	6
• Swelling of tissues	6
• Dizziness	5
• Weightlessness, levitation	5
• Healing	5
• Sexual encounters	5
• Deaths	5
• Diarrhea	4
• Hair loss	4
• Nightmares	4

• Claimed ESP development	4
• Nose bleeds	3
• Tastes	3
• Ringing in ears	3
• Weight loss	3
• Breathing problems	3
• Urination problems	3
• Gynecological problems	3
• Claimed implant	3
• Perceived teleportation	3
• Stunned	2
• Itching	2
• Loss of taste	2
• Loss of hearing	2
• Induced feeling of calm, serenity	2

And, in no particular order, one each of: EM effects on power system, involuntary muscle movement, induced body odor, wart growth, sooty deposit, mental enhancement, mental degradation, swallowing difficulty, teeth vibration, fillings crumbled, hair precipitously turned white, time sped up, unaccounted-for pregnancy, cancer, fever, stomach sickness, physiological energization, loss of smell, external control of vehicle, material evidence.

Appendix B: Green/Morris Example to Show the Global Breadth of Available Older ICD Case Inputs From Multiple Data Sources (red =pending ICD classification)

1. 1952 SOUTH AFRICA, WORCESTER CAPE
2. 1952/07/22 AUSTRALIA, NSW, SYDNEY
3. 1952/07/24 ITALY, VICO
4. 1954/09/10 FRANCE, VALENCIENNES
5. 1954/09/17 FRANCE, CENON
6. 1954/09/28 FRANCE, BOUZAIS
7. 1954/09/30 FRANCE, MARCILLY-SUR-VIENNE
8. 1954/10/01 FRANCE, BRY
9. 1954/10/05 FRANCE, LE MANS
10. 1954/10/07 FRANCE, MONTEUX
11. 1954/10/09 FRANCE, LAVOUX
12. 1954/10/11 FRANCE, SASSIER
13. 1954/10/13 FRANCE, BOURRASOLE
14. 1954/10/16 FRANCE, BAILLOLET
15. 1954/10/18 FRANCE, near COHEIX
16. 1954/10/20 FRANCE, TURQUENSTEIN
17. 1954/10/20 ITALY, PARRAVICINO D'ERBA
18. 1954/10/21 ITALY, MELITO
19. 1954/10/21 FRANCE, LA ROCHELLE
20. 1954/10/21 FRANCE, POUZOU
21. 1954/10/21 ENGLAND, RANTON, STAFFORDSHIRE
22. 1954/10/26 FRANCE, LA MADIERE
23. 1954/10/27 FRANCE, LINZEUX
24. 1954/11/02 BRAZIL, SANTO AMARO
25. 1954/11/05 FRANCE, LA ROCHE-EN-BRENIL
26. 1954/11/08 FRANCE, LA-TESSOUALLE
27. 1954/11/08 ENGLAND, CROYDON, SURREY
28. 1954/11/13 FRANCE, near BUCHY
29. 1954/11/14 ITALY, ISOLA
30. 1954/12/19 VENEZUELA, VALENCIA
31. 1955 VIRGINIA
32. 1955/01/23 PENNSYLVANIA, DARBY TOWNSHIP
33. 1955/03/30 ARIZONA, near TUCSON
34. 1955/07/17 ENGLAND, KENT
35. 1956/09 FRANCE, SERDON
36. 1956/10/02 NEW JERSEY, TRENTON
37. 1957/09 BRAZIL, CAMPINAS
38. 1957/11/02 TEXAS, nr. LEVELLAND
39. 1957/11/04 BRAZIL, FORT ITAIPU
40. 1957/11/04 NEW MEXICO, near OROGRANDE
41. 1957/11/05 TEXAS, SAN ANTONIO
42. 1957/11/10 OHIO, MADISON
43. 1957/12/07 TEXAS, DALLAS
44. 1958 OHIO, MADISON
45. 1958/01/27 PERU, AREQUIPA
46. 1958 NEW HAMPSHIRE, BETHLEHEM
47. 1958/10/26 MARYLAND, LOCH RAVEN DAM
48. 1959/04/24 BRAZIL, PIATA
49. 1959/04/27 BRAZIL, SAO PAULO
50. 1959/09/27 OREGON, COOS BAY
51. 1959/10 SWEDEN, MARIANNELUND
52. 1960/03/02 AUSTRIA, LABUTTENDORF
53. 1960/04 FRANCE, PUY-DE-DOME

- 54. 1960/09FLORIDA, BRUNNEL/ST. AUGUSTINE
- 55. 1961/03ENGLAND, PATERSON'S GROYN, near DURHAM
- 56. 1962/11ARGENTINA, SALTA/SAN MIGUEL DE TUCUMAN
- 57. 1963/08/04ILLINOIS, WAYNE CITY
- 58. 1963/10/12BRAZIL, MONTE-MAIZ
- 59. 1964/04/14CALIFORNIA, nr. CHICO
- 60. 1964/06/02NEW MEXICO, HOBBS
- 61. 1964/06/29GEORGIA, nr. LAVONIA
- 62. 1964/09/14FRANCE, VALENCIENNES
- 63. 1965/03/15FLORIDA, nr. IMOKALLEE (110 miles from Ft. Myers)
- 64. 1965/09/03TEXAS, nr DAMON
- 65. 1965/09/14ENGLAND, nr MERSEA, ESSEX
- 66. 1965/12/20MINNESOTA, nr HERMANN
- 67. 1966CANADA, HAMILTON, ONTARIO
- 68. 1966/04NEW YORK, nr SINCLAIRVILLE
- 69. 1966/04/01OKLAHOMA, TANGIER
- 70. 1966/04/17OHIO, nr AKRON
- 71. 1966/04/25PENNSYLVANIA, nr TOWANDA
- 72. 1966/04/28ENGLAND, SAWTRY
- 73. 1967SOUTH DAKOTA, PIERRE
- 74. 1968/01/02CANADA, WHITEHORSE, YUKON
- 75. 1968/02/19 CANADA, BENGOUGH, SASKATCHEWAN
- 76. 1968/03/19OHIO, BEALLSVILLE
- 77. 1968/04/04 WISCONSIN, nr. COCHRANE
- 78. 1968/06/25 ARGENTINA, SAN LORENZO
- 79. 1968/07/01ARGENTINA, RICARDONE
- 80. 1968/08FRANCE, COTE D'OR REGION
- 81. 1968/08NEW YORK, CATSKILL MOUNTAINS, nr. ALBANY
- 82. 1968/08/29NEVADA, nr. ELY
- 83. 1968/09/01ARGENTINA, MENDOZA
- 84. 1968/09/09BRAZIL, LINS
- 85. 1968/11/01PERU
- 86. 1969/2-4ENGLAND, nr. RAF FAIRFORD, WILTSHIRE
- 87. 1969/02/06BRAZIL, PIRASSUNUNGA
- 88. 1969/03/04MISSOURI, nr. ATLANTA
- 89. 1969/03/06MISSOURI, GLENWOOD
- 90. 1969/03/11BRAZIL, CAMPINAS, SAO PAULO
- 91. 1969/06/19ENGLAND, DOCKING
- 92. 1970/08/30BRAZIL, ITATIAIA
- 93. 70/8 or 9AUSTRALIA, SYDNEY, NEW SOUTH WALES
- 94. 1970/10/29NORWAY, JAEREN
- 95. 1971/08/01AUSTRALIA, GLADSTONE, QUEENSLAND
- 96. 1971/09/20SWEDEN, nr. ALVBYNVAGEN

Appendix C

Green /Morris ICD-Codes [47] versus Environmental Effects after Vallee CE2,CE4,CE5; AN5; MA5; FB5 Ratings [48] ; SVP (Source, Visit, Possible explanation and ratings not germane) *in draft- progress.*

NOTES:

1} The National Center for Health Statistics (NCHS), the Federal agency responsible for use of the International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) in the United States, has developed a clinical modification of the classification for morbidity purposes.

The clinical modification represents a significant improvement over ICD-9-CM and ICD-10. Specific improvements include: the addition of information relevant to ambulatory and managed care encounters; expanded injury codes; the creation of combination diagnosis/symptom codes to reduce the number of codes needed to fully describe a condition [47]

2} Vallee Ratings [48]

AN RATING Classifies any anomalous behaviour.	
AN1	Anomalies which have no lasting physical effects. i.e. amorphous lights, unexplained explosions.
AN2	Anomalies which <i>do</i> have lasting physical effects. i.e. poltergeists, materialized objects, areas of flattened grass, corn circles.
AN3	Anomalies with associated entities. i.e. ghosts, yetis, spirits, elves and other mythical/legendary entities.
AN4	Witness interaction with the AN3 entities. i.e. near-death experiences, religious miracles and visions, OBEs (out-of-body experiences).
AN5	Anomalous reports of injuries and deaths. i.e. SHC(spontaneous human combustion), unexplained wounds as well as permanent healing that results from a paranormal experience.

MA RATING	
Describes behavior of a UFO. It is analogous to the Nocturnal Light , Daylight Disk and Radar Visual Hynek classifications.	
MA1	A UFO has been observed which travels in a discontinuous trajectory. i.e. vertical drops, maneuvers or loops.
MA2	MA1 plus any physical effects caused by the UFO.
MA3	MA1 plus any entities observed on board. i.e. the airship cases of the late nineteenth century.
MA4	Maneuvers accompanied by a sense of reality transformation for the observer.
MA5	A maneuver that results in a permanent injury or death of the witness.

FB RATING	
Fly-by rating.	
FB1	A simple sighting of a UFO traveling in a straight line across the sky.
FB2	FB1 accompanied by physical evidence.
FB3	A fly-by where entities are observed on board (rare).
FB4	A fly-by where the witness experienced a transformation of reality into the object or its occupants.
FB5	A fly-by which the witness would suffer permanent injuries or even death. i.e. CASH/LANDRUM CASE .

CE RATING	
Close Encounter rating. Similar to the Hynek Close Encounter ratings .	
CE1	UFO comes within 500 feet of the witness, but no after effects are suffered by the witness or the surrounding area.
CE2	A CE1 that leaves landing traces or injuries to the witness.
CE3	Entities have been observed on the UFO.
CE4	The witness has been abducted.
CE5	CE4 which results in permanent psychological injuries or death.

3} HIPAA Compliance of this Study - HIPAA: Acronym that stands for the Health Insurance Portability and Accountability Act, a US law designed to provide privacy standards to protect patients' medical records and other health information provided to health plans, doctors, hospitals and other health care providers. Developed by the Department of Health and Human Services, these new standards provide patients with access to their medical records and more control over how their personal health information is used and disclosed. They represent a uniform, federal floor of privacy protections for consumers across the country. [49]

~~UNCLASSIFIED//FOR OFFICIAL USE ONLY~~

[illegible]

~~UNCLASSIFIED//FOR OFFICIAL USE ONLY~~

~~UNCLASSIFIED//FOR OFFICIAL USE ONLY~~

[illegible]

~~UNCLASSIFIED//FOR OFFICIAL USE ONLY~~