Frontier Analysis, Ltd

TECHNICAL SERVICE RESPONSE NO.: UT086

Subject: Analysis of a Fragment "I-Beam" from a Purported Crash Site of an Unknown Airborne Craft on the Plains of San Augustin, New Mexico circa Early July 1947 (CMS Case File: 52614)

Date: August 22, 2014

Requested By: Paul Garver
ASD MUFON
New Mexico

Reported By: P. A. Budinger
Analytical Scientist

ICP Analyst: Arthur W. Varnes, Ph.D.
ICP and ICP-MS Services

Background/Objective:

Fragments were gathered from a purported crashed unidentified aerial craft in the Plains of San Augustine, which occurred the first week of July in 1947. One fragment found by Chuck Wade (Wade-1) was previously analyzed by this Laboratory.[1] A second fragment also found by Wade, called "I-beam", was submitted for analysis. It is designated "I-Beam" because of its similar appearance to one. The object is to determine if there are any anomalous properties of the sample that could be related to an extraterrestrial craft. Specifically, one such anomaly would be the presence of fragment elements that have different isotopic ratios than their terrestrial counterparts.[2]

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[1] See Frontier Analysis Technical Service Report: UT085. This analysis did not reveal evidence for extraterrestrial origin of the fragment. It was found to be an aged heavy duty aluminum foil which had been exposed to the natural environment for a number of years.

[2] Isotopic (measurements) ratios of the elements can be taken by ICP-MS (Inductively Coupled Plasma/Mass Spectrometry) to see if they differ from terrestrial values. An element is defined by the number of protons in its nucleus. Most elements have two or more isotopic forms. That is, the element may have more or less neutrons. Each neutron has a weight of one. So an isotope with more neutrons weighs more than an isotope with less. The ratios of isotopes for any given element on Earth will always be the same, i.e. it is a constant. The theory is that these isotopic ratios might be a result of the elements formation in the earliest phase of our solar system, i.e. they are unique to this system. It is thought that these ratios might vary in other solar systems because the elemental formations may have been different. So, if we find the ratios are not normal as compared to terrestrial elements, then the sample may have an extraterrestrial origin.

Conclusions:

●The "I-Beam" appearing fragment is mostly composed of aluminum coated with very small amounts of aluminum oxide (Al_2O_3) corrosion and environmental debris. The environmental debris include a protein-type material (animal, insect, mold or bacteria derived), calcite (calcium carbonate) and unidentified oxidized organic material which could be humate derived.

●The analysis shows the fragment, excluding any environmental debris, is greater than 97% aluminum which appears to be alloyed with small amounts magnesium, silicon and possibly iron. This alloy is in the 6000 series classification by the International Alloy Designation System[3]. Specifically, 6060, 6061 or 6063 could be the aluminum grade. These, especially the most common 6061, have many uses: architectural and structural applications; automotive components; boats; aerospace; aircraft; etc. A search of the internet reveals many companies who manufacture I-Beams in these three aluminum grades, and they come in many sizes.[4]

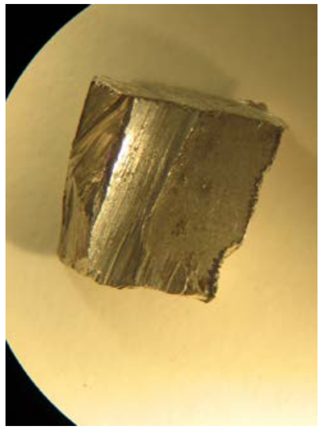
●The analytical testing of this fragment does not reveal an indication of an extraterrestrial origin. Isotopic analysis done on nickel, copper and gallium are consistent with terrestrial values for these elements.

Procedure:

Sample: The sample analyzed is designated I-Beam A. The fragment was received by Paul Garver from Chuck Wade on March 16, 2014. He divided it in two pieces, labeled them I-Beam A and I-Beam B, and placed the halves in resealable plastic bags. The samples were sent C/O Jan Harzen to MUFON headquarters in California, and in turn submitted to this laboratory and received on March 27, 2014. I-Beam A weighed 0.8337 grams and is 0.14" (3.7 mm) thick. Following is a photograph of the fragment.

[3] Grade designations, properties and compositions of each Series can be found a number of on line sources such as Ryerson Stock List, http://portal.ryerson.com/stocklist/home.html; 29th Edition Machinery's Handbook by E. Oberg et al., Industrial Press Inc. New York, http://findebookee.com/2/29th-edition-machinery-handbook: Wikipedia http://en.wikipedia.org/wiki/Aluminum_ alloy. The 6000 series…" utilize magnesium and silicon n various proportions to form magnesium silicide, making them heat treatable. A major alloy in this series is 6061, one of the most versatile of the heat-treatable alloys. The magnesium-silicon (or magnesium-silicide) alloys possess good formability and corrosion resistance with high strength." are characterized by excellent corrosion resistance, high thermal and electrical conductivity, low mechanical properties and excellent workability.

[4] http://www.amazon.com/dp/B000H9TGW2/ref=asc_df_B000H9TGW23256243?smid=ATVPDKIKX0DER&tag=pg-1606-86-20&linkCode=df0&creative=395093&creativeASIN=B000H9TGW2; http://www.azom.com/article.aspx?ArticleID=2812; http://www.alibaba.com/showroom/aluminum-beam-6061-6060-6063.html; etc.



ICP-MS and ICP-AES Semi-Quantitative Elemental Analysis: This analysis was performed by Dr. Arthur W. Varnes, ICP and ICP-MS Services, Cleveland, Ohio. (A description of these two elemental techniques can be found in the appendix.)

The sample was prepared for ICP by cleaning using the following procedure. Twenty mL of reagent grade acetone was added to a clean, dry Teflon beaker. The beaker was placed in an ultrasonic bath for five minutes. This process was repeated two more times. Then the dried "I-Beam" A sample was immersed in a mixture of 2.0 mL of 70% nitric acid, 3.0 mL of deionized water, 1.0 mL of 36% hydrochloric acid and 0.5 mL of 49% hydrofluoric acid. This mixture was added to a 123 mL capacity Parr digestion vessel. The contents of this Parr digestion vessel were immediately transferred to a clean, dry 2-oz polyethylene bottle and diluted to 45 g with deionized water. A sample preparation blank was prepared as above except that no sample was added. Semi-quantitative analysis was then performed using a Thermo iCAP Q ICP mass spectrometer and a Perkin-Elmer 3000 ICP emission spectrometer.

Nickel, copper and gallium were selected for isotopic analysis. The terrestrial reference solution and sample preparation blank solution were prepared. Eleven isotopic abundances were then measured for: Fe-54, Fe-56, Fe-5, (Fe + Ni)-58, Ni-60, Ni-62; Cu-63, and Cu-65; and Ga-69 and Ga-71 using the above Thermo iCAP Q ICP mass spectrometer.

FT-IR Analysis: Infrared spectra were obtained from two scrapings of the fragment surface. All FT-IR (Fourier Transform-Infrared Spectra)[5] were acquired on the Thermo Electron Avatar 360 spectrometer using the Smart Herrick diamond sampling accessory.

Other Analysis: Microscope photographs were obtained using a Canon A520 digital camera interfaced to a Leica GZ6 stereomicroscope.

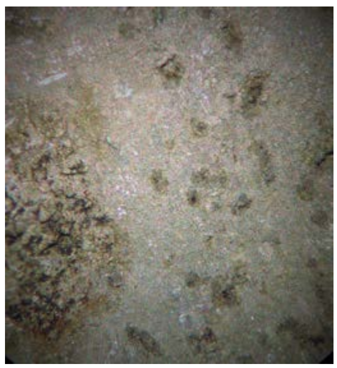
[5] **FT-IR (Fourier Transform Infrared Spectroscopy):** Infrared spectroscopy is used for the molecular structure identification and quantification of solids, liquids, and gases. An infrared spectrum is the result of light (in the 2 to 25 micron wavelength range) interacting with the vibrations of molecules. The particular set of vibrations of a molecule gives rise to specific spectral absorption bands, often referred to as the "fingerprint" spectrum.

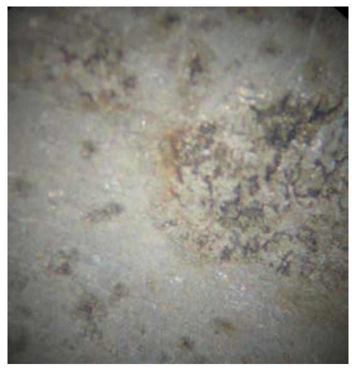
Results:

The detailed results of the individual tests done on the fragment follow. These results are summarized in the conclusions section on the page two of this report.

Microscopic Examination

Microscopic examination of the fragment suggests a very small amount of surface contamination on this sample. Corrosion is apparent as noted by a dull gray color and the pitted appearance. Infrared analysis detected trace amounts of other environmental debris. (See those results below.) Following are two photographs of the surface

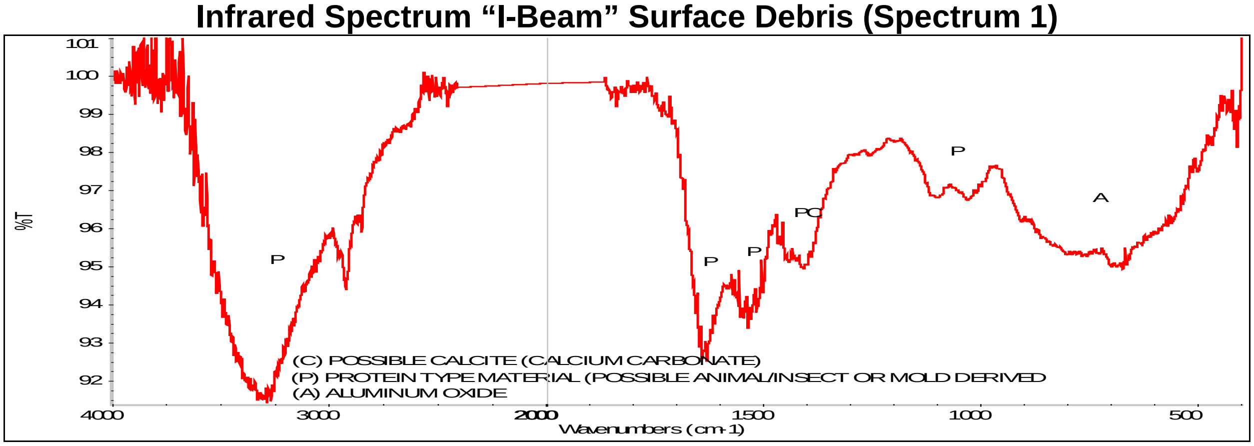




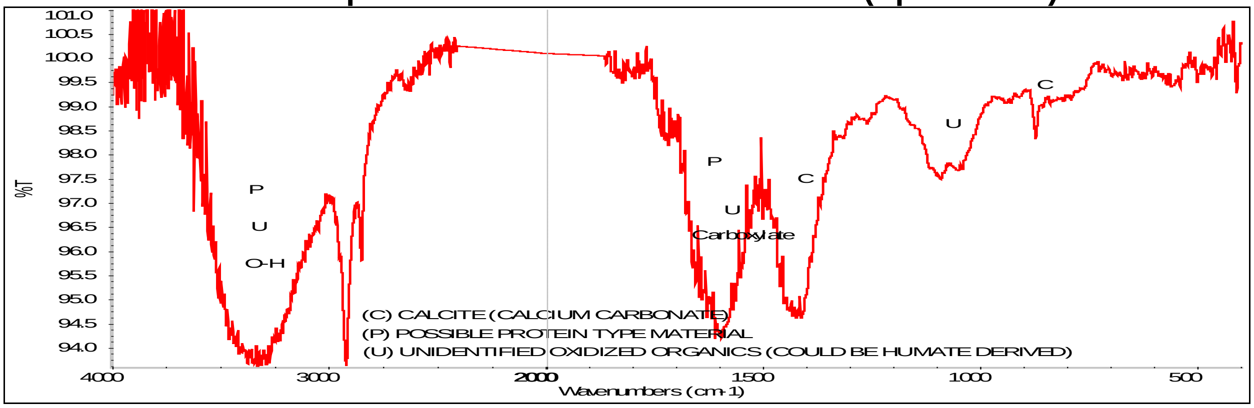
Infrared Analysis of Surface Material

The fragment had so little debris that a good spectrum could not be taken directly from the sample surface. Therefore, spectra were taken of small amounts of scrapings. Aluminum oxide (Al_2O_3) corrosion, a protein-type material (animal, insect, mold or bacteria derived.) and calcite (calcium carbonate) are detected in one spectrum. A second spectrum shows calcite, possible protein-type material, and unidentified oxidized organic material which could be humate derived. Following are the spectra with interpretation included. (Pertinent reference spectra can be found in the appendix)

Infrared Spectrum "I-Beam" Surface Debris (Spectrum 1)



Infrared Spectrum "I-Beam" Surface Debris (Spectrum 2)



ICP-MS and ICP-AES Semi-Quantitative Analysis

ICP-MS and ICP-AES semi-quantitative elemental analysis of the fragment were done for 70 elements. (See the appendix for the report 'as issued' from ICP and ICP-MS Services.) Following are the results.

Elements	Concentration
Al	>10 %
Fe*, Mg*, Si*	0.1 - 1 %
Cr, Cu, Mn	0.01 – 0.1 %
Ca*, Ga, K*, Na*, Ni, Ti, V	0.001 – 0.01% (10 – 100 ppm)
P*, S*	<0.01% (100 ppm)
Co, Ge, Mo, Pb, Sn, Zn, Zr	1 – 10 ppm
Au, Ba, Bi, Ce, Hf, La, Nd, Sb, Sr, Ta, U, W	0.1 – 1 ppm
Ag, As, B, Be, Cd, Cs, Dy, Er, Eu, Gd, Hg, Ho, In, Ir, Li, Lu, Nb, Os, Pd, Pr, Pt, Rb, Re, Rh, Ru, Sc, Se, Sm, Tb, Te, Th, Tl, Tm, Y, Yb	<0.1 ppm

*Asterisk denotes concentrations determined by ICP-AES. No asterisk indicates ICP-MS values.

Evaluation of the above data indicates the fragment is >97% aluminum. It appears to be alloyed with very small amounts of other elements such as magnesium, silicon and possibly iron. Other trace metals are detected.

This aluminum alloy can most likely be classified 6000 series by the International Alloy Designation System. Specifically, 6060, 6061 or 6063 could be the aluminum grade. These, especially the most common 6061, have many uses: architectural and structural applications; automotive components; boats; aerospace; aircraft; etc. A search of the internet reveals many companies who manufacture I-Beams in these three aluminum grades, and they come in many sizes.

ICP-MS Isotopic Ratios

The above elemental data were further evaluated to determine which elements were good candidates for isotopic analysis. Copper (Cu) and nickel (Ni) were selected because they were reported to have anomalous ratios by another analyst.[6] Then a third element, gallium (Ga), was also selected because is not commonly found. The data show that all the fragment nickel, copper and gallium isotopic ratios are clearly within terrestrial values. Following is a table of the values as received from ICP and ICP-MS Services. All results are reported as percent abundances.
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Isotope Abundance	Terrestrial Reference, %	I-Beam, %	Accepted Value
Ni-58*	67.8 ± 0.3	68.3 ± 0.2	68.08
Ni-60	26.5 ± 0.3	26.0 ± 0.1	26.22
Ni-61	1.14 ± 0.02	1.15 ± 0.04	1.14
Ni-62	3.63 ± 0.1	3.62 ± 0.1	3.63
Ni-64**	Not Determined	Not Determined	0.93
Cu-63	69.5 ± 0.4	68.8 ± 0.5	69.17
Cu-65	30.5 ± 0.6	31.2 ± 0.5	30.83
Ga-69	60.4 ± 0.7	59.6 ± 0.4	60.11
Ga-71	39.6 ± 0.7	40.4 ± 0.4	39.89

*Ni-58 is interfered by F-58, so it was necessary to measure the four Fe natural abundant isotopes (Fe-54, Fe-56, Fe-57 and Fe-58) to correct for this Fe-58 interference. See procedure on page three.
**Zn-64 is 48% abundant while Ni-64 is only 0.93% abundant, so it is not possible to determine Ni-64 in the presence of zinc.

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Phyllis A. Budinger

[6] Arthur H. Campbell, "Finding the UFO Crash at San Augustin", Medford, Oregon, 2013.

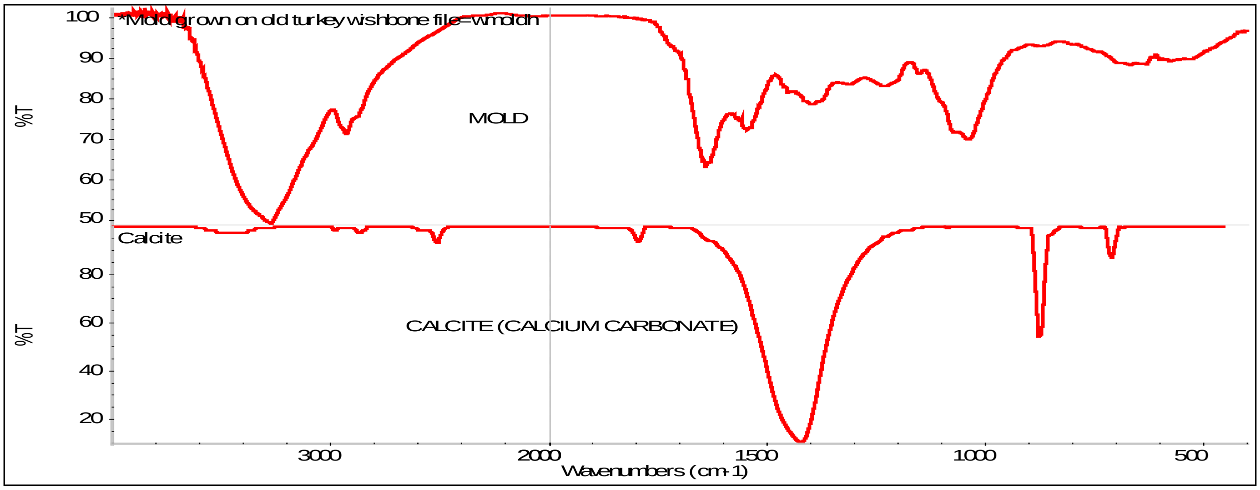
APPENDIX

Infrared References
Mold
Calcite (Calcium Carbonate)
Aluminum Oxide (Al_2O_3)

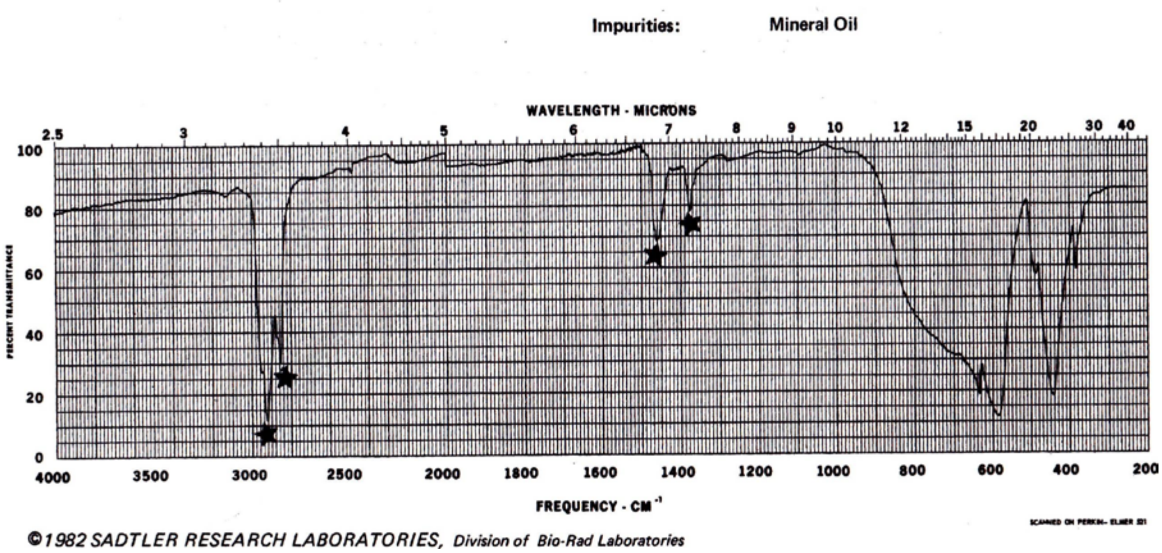
ICP-MS and ICP-AES
(Description of Tests)

ICP-MS and ICP-AES Analysis
(Report as received from
ICP and ICP-MS Services)

Infrared References



Aluminum Oxide (Al_2O_3) Infrared Reference



Following is the description of ICP-MS and ICP-AES instrumentation as edited from a description by EAG (Evens Analytical Group).[7]

An **ICP** is an Inductively Coupled Plasma, which is the excitation source used in Optical Emission and Mass Spectrometry instruments. The ICP source consists of a quartz torch inside a radio frequency (RF) coil. Argon is passed through the torch and RF energy is applied to the coil. When a spark is added to the highly energized argon atoms, electrons are stripped from the argon, and the plasma is formed. The argon ions and free electrons are further agitated by the RF field, causing the temperatures within the plasma to reach approximately 8000-10,000 Kelvin. In most analyses using ICP techniques, the sample is introduced in liquid form, meaning solid materials will need to be dissolved in an aqueous solution prior to analysis. The liquid is converted to an aerosol using a nebulizer and is then sprayed into the center of the plasma. Very quickly (in both distance and time), the particles within the aerosol are dried, atomized, ionized, excited and relaxed. It is from this point forward that the two instrument types differ. It's based on two different approaches for detection (AES or MS) of the ICP plasma. Each method has its strengths. AES detection is better for high concentrations that MS detection. Some elements are not detected.

An **ICP-AES (I**CP-Atomic Emission Spectrometer) separates the light emitted from the plasma into discrete component wavelengths using a diffraction grating. Each element in the periodic table has its own distinct set of emission wavelengths. CCD detectors are used to quantify the amount of light at a given wavelength. Within the calibration range of the instrument, the amount of light on a given wavelength is proportional to the concentration of the corresponding element in the solution presented to the instrument. Once this concentration is known, the mass fraction of the element in the material being tested can be calculated. Its element range is: lithium through uranium, except atmospheric species (carbon, hydrogen, oxygen, nitrogen) and noble gases.

The **ICP-MS** (ICP-Mass spectrometer) samples the ions generated in the plasma, and directs them through a quadrupole mass spectrometer. The quadrupole filters the ions based on their mass to charge ratio (m/z) so that only ions with a specific m/z reach the electron multiplier detection system. Within the calibration range of the method, the signal intensity for a given analyte ion is proportional to its concentration in the solution presented to the instrument. The solution concentration is them used to calculate the mass fraction of the analyte in the material being tested. Its element range is: lithium through uranium, except sulfur, atmospheric species (carbon, hydrogen, oxygen, nitrogen) and noble gases

[7] http://www.eag.com

ICP and ICP-MS Services
3522 Stoer Road Cleveland, OH 44122 (216) 921-7457

ICP SEMI-QUANTITATIVE ANALYSIS

Prepared for: Phyllis Budinger
Frontier Analysis, Ltd.

Date Reported: July 28, 2014

ICP-MS Results – Sample I Beam

Concentration	Elements
>10 %	Al
1 – 10 %	None
0.1 –1 %	None
0.01 – 0.1 %	Cr, Cu, Mn
10 – 100 ppm	Ga, Ni, Ti, V
1 – 10 ppm	Co, Ge, Mo, Pb, Sn, Zn, Zr
0.1 – 1 ppm	Au, Ba, Bi, Ce, Hf, La, Nd, Sb, Sr, Ta, U, W
<0.1 ppm	Ag, As, B, Be, Cd, Cs, Dy, Er, Eu, Gd, Hg, Ho, In, Ir, Li, Lu, Nb, Os, Pd, Pr, Pt, Rb, Re, Rh, Ru, Sc, Se, Sm, Tb, Te, Th, Tl, Tm, Y, Yb

ICP-AES Results – Sample I Beam

Element	Concentration, ppm
Ca	10-100
Fe	1,000 – 10,000
K	10-100
Mg	1,000 – 10,000
Na	10-100
P	<100
S	<100
Si	1,000 – 10,000