U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

MAR 0 6 2018

Mr. Brian Chen
VP of Operations
Bluesmart, Inc.
729 Minna Street
San Francisco, CA 94103

Reference No. 16-0124

Dear Mr. Chen:

This letter is in response to your July 15, 2016, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR parts 171-180) applicable to a suitcase containing a lithium ion battery when carried aboard aircraft.

You state that your company manufactures and sells a suitcase that uses a non-removable lithium ion battery with a 39.52 Wh rating. You further explain that the battery powers the main functions of your suitcase, which include: a Bluetooth enabled lock; a built-in digital scale; a GPS location tracker; and USB ports to allow users to charge their portable electronic devices. Specifically, you seek confirmation of your understanding that this suitcase is authorized to be carried by passengers or crew if conforming to the portable electronic device provisions for passengers and crew aboard aircraft in § 175.10(a)(18) and electronic transmission requirements in 14 CFR part 91, § 91.21.

Your understanding of the requirement in § 175.10(a)(18) is correct. According to the information in your email and the supplemental attachments provided, the suitcase meets the criteria for a portable electronic device prescribed in § 175.10(a)(18). When carried by passengers or crew members for personal use, such suitcases that conform to the applicable provisions for portable electronic devices may be carried in either checked or carry-on baggage.

You should be aware that an FAA Information for Operators (InFO) 17008: The Transportation Portable Electronic Devices (PED) in Checked Baggage has been published on this issue and can be found on FAA's website at www.faa.gov. The InFO advises that devices containing lithium batteries should be transported in carry-on baggage and not placed in checked baggage. When that is not possible, the devices should be completely powered down to the OFF position, protected from accidental activation, and packed so they are protected from damage.

It is also important to note that the International Civil Aviation Organization (ICAO) during the twenty-sixth meeting of the Dangerous Goods Panel in Montreal, Canada on October 16 thru 27, 2017 adopted a new requirement that will require luggage equipped with a lithium battery to be carried as carry-on baggage, unless the battery is removed from the luggage. This new requirement will become effective in the January 2019 Edition of the ICAO Technical Instructions. This implementation will be applicable for all international transportation and on any air carriers that implement the ICAO or IATA requirements as policy. You should always verify the air carrier policies prior to transportation.

In addition to the HMR requirements, all applicable FAA requirements must be complied with, including those in 14 CFR, § 91.21 that address operation of portable electronic devices aboard aircraft. Information and guidance to assist with compliance of this requirement can be found in Advisory Circular (AC) 91.21-1C, titled "Use of Portable Electronic Devices Aboard Aircraft." For additional information regarding the FAA requirements or if you seek an interpretation on whether your particular device meets electronic transmission requirements contained in 14 CFR § 91.21 you may contact the FAA at the following address:

Federal Aviation Administration
Office of the Chief Counsel
Regulations Division
800 Independence Avenue SW
Washington, DC 20591

In addition to the transportation safety requirements pertaining to this device, there may be additional security requirements issued by the Transportation Security Administration.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

Duane A. Pfund
International Program Coordinator
Standards and Rulemaking Division

Wiener
§ 175.10.18
Batteries
16-0124

Dodd, Alice (PHMSA)

From: Rivera, Jordan CTR (PHMSA)
Sent: Monday, July 18, 2016 10:08 AM
To: Hazmat Interps
Subject: FW: Bluesmart Request for Interpretation
Attachments: Request for Letter of Interpretation.pdf; UN38.3 Report.pdf; Exhibit C.pdf; Exhibit B.PDF; Exhibit D.pdf; Exhibit A.PNG

Hi Shante/Alice,

Please submit this as a letter of interpretation. Mr. Chen's contact information is:

Bluesmart
33 Irving Pl
New York, NY 10003
206-605-6328

Please let me know if you have any questions.

Thanks,
Jordan

From: Brian Chen [mailto:brian@bluesmart.com]
Sent: Friday, July 15, 2016 12:25 PM
To: PHMSA HM InfoCenter
Subject: Bluesmart Request for Interpretation

To Whom It May Concern:

Please find attached a Request for Interpretation in regard to the carry-on suitcase designed and sold by Bluesmart Inc. Should you require original copies of any documentation or any additional information, I would be happy to send. Please let me know if you have any questions.

I look forward to hearing back. If you could provide a sense for when we can expect to hear back, that would be greatly appreciated.

Best,
Brian
--
Brian Chen
Co-Founder & VP Operations

bluesmart

July 14, 2016

U.S. Department of Transportation
PHMSA Office of Hazardous Materials Standards
Attn: PHH-10
East Building
1200 New Jersey Avenue, SE
Washington, DC 20590-0001

Re: Request for Letter of Interpretation

To Whom It May Concern:

Our company, Bluesmart Inc., sells and manufactures a carry-on suitcase that utilizes a lithium ion battery. The primary use of the battery in the suitcase is to power the main functions of our suitcase, which include a Bluetooth-enabled lock, a built-in digital scale, and 3G + GPS location tracking. As a secondary function of the battery, USB ports are provided to allow users to charge their portable electronic devices. We would like to request a letter of interpretation in regard to the inclusion of the Lithium-Ion battery.

It is our understanding that our product complies with 49 CFR §175.10.18 due to the fact that: 1) our battery is "installed"; 2) is "of a type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, Sub-section 38.3"; and 3) has a Watt-hour rating of 39.52 Wh. For reference, please find enclosed the UN38.3 test results and the Material Safety Data Sheet we use when shipping our product.

To provide additional context around the design of our product, the battery in our carry-on suitcase is not removable, and the housing has been designed for maximum safety. In addition to the images included in the UN38.3 test results, see Exhibit A, which shows the location of the battery housing within the suitcase shell. See Exhibit B for a more detailed layout of how the battery housing design. See Exhibit C for additional information on the flame retardant materials used in the housing.

Finally, it is our understanding that our product complies with FAA Advisory Circular (AC) 91.21-1C dated 5/7/2015 (specifically Section 8) due to having three different means of turning off electronic transmissions. First, users can turn the suitcase off manually via the on/off switch. Second, users can turn the suitcase off via the mobile application that connects to the suitcase. Finally, we have developed algorithms and

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San Francisco, CA 94103
bluesmart.com

bluesmart

conducted tests to ensure the automatic shutdown of electronic transmissions upon flight takeoff. See Exhibit D for a brief memo that explains our methodology and results.

We request a letter of interpretation so that we may confirm the compliance of our product with current regulations. Should you require further information to make your interpretation, please do not hesitate to contact us.

Thank you in advance for your response.

Best Regards,

Brian Chen
VP of Operations

Bluesmart Inc.
729 Minna St
San Francisco, CA 94103
bluesmart.com

检 测 报 告

TEST REPORT

委托单位名称 **Client Name**	中山天贸电池有限公司 Zhongshan Tianmao Battery Co.,LTD.
产 品 名 称 **Name of product**	锂离子电池 Li-ion Battery
制 造 厂 商 **Manufacturer**	中山天贸电池有限公司 Zhongshan Tianmao Battery Co.,LTD.
商 标 型 号 **Trade mark & model**	TMB/BP702
检 测 类 别 **Test sort**	委托测试 Safety Entrust Test

中检集团南方电子产品测试（深圳）有限公司
CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.
地 址：广东省深圳市南山区西丽街道西丽工业区石鼓东 28、29 栋 邮政编码/P.C.：518055
Address: Building 28、29, Shigu east, Xili Factory District, Xili Road, Nanshan District, ShenZhen, Guangdong, China
电话/TEL：86-755-26628136 传真/FAX：86-755-26701436
网址/Internet：http:// www.ccic-set.com 电子信箱/E-Mail：sophie.wang@ccic-set.com
查询码：B1YDYXY7

中检集团南方电子产品测试(深圳)有限公司
CCIC Southern Electronic Product Testing (Shenzhen) CO., Ltd.

检 测 报 告
TEST REPORT

样品名称 Name of sample	锂离子电池 Li-ion Battery		商 标 Trade mark	TMB	
制造厂商 Manufacturer	中山天贸电池有限公司 Zhongshan Tianmao Battery Co.,LTD.		型号规格 Model/Type	BP702	
委托单位 Client	中山天贸电池有限公司 Zhongshan Tianmao Battery Co.,LTD.		取样方式 Sampling method	Sent by client	
送检日期 Application data	2015/07/31		完成日期 Completing Date	2015/08/27	
样品数量 Quantity of samples	8 个电池组，25 个电池 8 Batteries,25 Cells		检验环境 Environment condition	15～35℃ 45～75%RH	
标称电压 Nominal voltage	3.8V	充电限制电压 Limited Charge Voltage	4.3V	额定能量/容量 Rate Energy/Capacity	39.52Wh/10 400mAh
标准充电电流 Standard charge current	1040mA	最大充电电流 Max. Charge Current	3120mA	充电截止电流 End Charge Current	208mA
放电终止电压 Cut-off Voltage	2.75V	最大放电电流 Max.Discharge Current	5200mA	电池数量 Component cells Number	4PCS

检验项目(Test item):

Test1：高度模拟 Altitude simulation

Test2：温度试验 Thermal Test

Test3：振动 Vibration

Test4：冲击 Shock

Test5：外短路 External short circuit

Test6：撞击/挤压 Impact/Crush

Test7：过充电 Overcharge

Test8：强制放电 Forced discharge

检测依据(Reference documents):

《关于危险货物运输的建议书 试验和标准手册》(第五次修订版本) 38.3 节：金属锂电池和锂离子电池组。

《Recommendations on the Transport of Dangerous Goods,Manual of Test and Critera》section 38.3:Lithium metal and lithium ion batteries (ST/SG/AC.10/11/Rev.5/Amend.1&Amend2).

检验概况(Summary):

对电池或电池组进行了 T1 至 T8 项试验，试验 T1 至 T5 按顺序进行，使用相同电池或电池组，试验 T6 和 T8 使用未另外试验过的电池或电池组，试验 T7 使用原先试验 T1 至 T5 中使用过的未损坏的电池组进行试验。

Each Cell/battery type is subjectd to tests 1 to 8,Tests 1 to 5 are conducted in sequence on the same Cells/batteries,Tests 6 and 8 are conducted using not otherwise tested Cells/batteries,Test 7 using undamaged batteries previously used in Tests 1 to 5.

质量损失 Mass loss%=$(M_1-M_2)/M_1\times100$

式中：M1 是实验前的质量，M2 是试验后的质量，如果质量损失不超过表 3.8.3.1 所列的数值，视为“无质量损失”。

Where M_1 is the mass before the test and M_2 is the mass after the test. When mass loss does not exceed the values in Table 38.3.2.2, it shall be considered as "no mass loss".

Mass M of cell or battery	Mass loss limit
M＜1g	0.5%
1g≤M≤75g	0.2%
M＞75g	0.1%

试验 T1 至 T4 如果电池组无渗漏、无排气、无解体、无破裂和无起火，并且每个试验电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%则认为符合要求。

In test 1 to 4 batteries meet this requirement if there is no leakage,no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

备注（Remark）：

编号 B01#-B04#是在第一个充放电周期完全充电的电池组。

Batteries of B01#-B04# are fully charege at first cycle.

编号 C9#-C13#是在第一个充放电周期 50%设计额定容量状态的元件电池。

Component cells of C9#-C13# at 50% of the design rated capacity at first cycle.

编号 B05#-B08#是在 50 个充放电周期后完全充电的电池组。

Batteries of B05#-B08# are fully charege after 50 cycles.

编号 C14#-C23#是在第一个充放电周期完全放电的元件电池。

Component cells of C14#-C23# at first cycle in fully discharged states.

编号 C24#-C33#是在 50 个充放电周期后完全放电状态的元件电池。

Component cells of C24#-C33# are fully Discharege after 50 cycles.

检验结论(Test conclusion):

测试样品符合联合国《关于危险货物运输的建议书 试验和标准手册》38.3 要求。

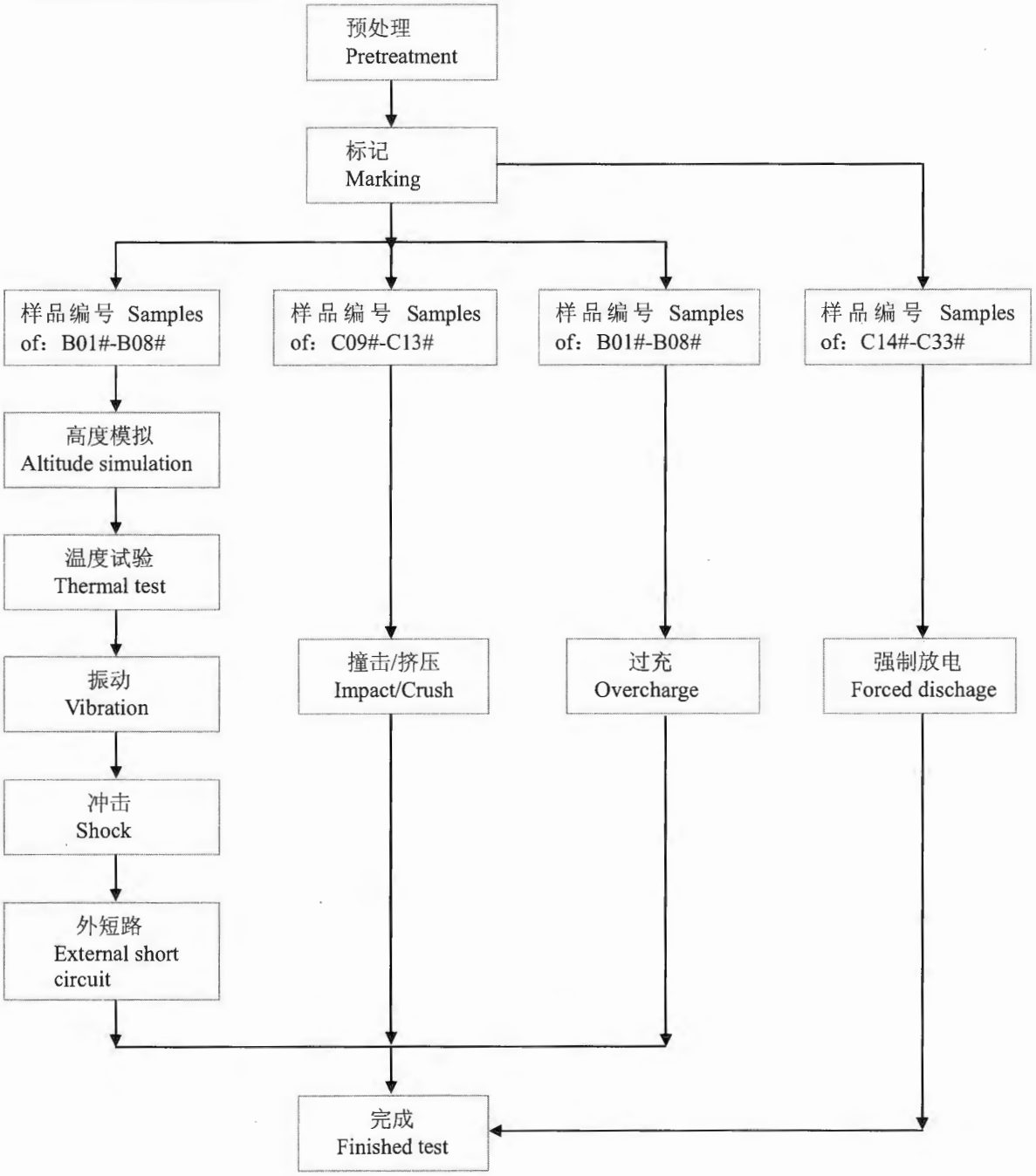
The test samples comply with section 38.3 of Recommendations on the Transport of Dangerous Goods,Manual of Test and Critera.

（检验单位盖章 Stamp）

检测专用章

检 测: Tested by	审 核: Reviewed by	批 准: Approved by
2015 年 08 月 27 日	2015 年 08 月 27 日	2015 年 08 月 27 日

测试流程 Test Procedure



测试结果 Test results：

Test T.1 高度模拟 Altitude siuiation

测试方法 Test method:

电池组在压力等于或低于 11.6 千帕和环境温度(20±5℃)下存放至少 6 小时。

Batteries are stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20±5℃).

要求 Requirement:

电池组如无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池组即符合这一要求。

Batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (g)	电压 Voltage (V)	质量 Mass (g)	电压 Voltage (V)			
第一个充放电周期完全充电 At first cycle in fully charged states	B01#	178.230	4.34	178.195	4.33	0.02	99.77	PASS
	B02#	178.564	4.33	178.560	4.32	0.00	99.77	PASS
	B03#	178.443	4.34	178.430	4.34	0.01	100.00	PASS
	B04#	178.352	4.33	178.347	4.32	0.00	99.77	PASS
五十个充放电周期后，完全充电 After 50 cycles ending in fully charged states	B05#	178.640	4.34	178.581	4.32	0.03	99.54	PASS
	B06#	178.551	4.34	178.548	4.32	0.00	99.54	PASS
	B07#	178.446	4.34	178.435	4.32	0.01	99.54	PASS
	B08#	178.232	4.33	178.220	4.32	0.01	99.77	PASS

备注 Notes:

试验后电池组无渗漏、无排气、无解体、无破裂和无燃烧，环境温度 24.7℃。

After the test,the batteries are no leakage,no venting, no disassembly, no rupture and no fire.

Ambient temperature:24.7℃.

Test T.2: 温度试验 Thermal test

测试方法 Test method:
电池组在试验温度等于 75±2℃下存放至少 6 小时，接着在试验温度等于—40±2℃下存放至少 6 小时。两个极端试验温度之间的最大时间间隔为 30 分钟。这一程序重复 10 次，接着将所有试验电池组在环境温度(20±5℃)下存放 24 小时。
Batteries are to be stored for at least six hours at a test temperature equal to 75±2℃, followed by storage for at least six hours at a test temperature equal to -40±2℃. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated 10 times, after which all test batteries are to be stored for 24 hours at ambient temperature (20±5℃).
要求 Requirement:
电池组如无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池组即符合这一要求。
Batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (g)	电压 Voltage (V)	质量 Mass (g)	电压 Voltage (V)			
第一个充放电周期完全充电 At first cycle in fully charged states	B01#	178.195	4.33	178.172	4.25	0.01	98.15	PASS
	B02#	178.56	4.32	178.512	4.25	0.03	98.38	PASS
	B03#	178.430	4.34	178.393	4.28	0.02	98.62	PASS
	B04#	178.347	4.32	178.336	4.24	0.01	98.15	PASS
五十个充放电周期后，完全充电 After 50 cycles ending in fully charged states	B05#	178.581	4.32	178.543	4.23	0.02	97.92	PASS
	B06#	178.548	4.32	178.521	4.24	0.02	98.15	PASS
	B07#	178.435	4.32	178.410	4.23	0.01	97.92	PASS
	B08#	178.220	4.32	178.192	4.24	0.02	98.15	PASS

备注 Notes:
试验后电池组无渗漏、无排气、无解体、无破裂和无燃烧，环境温度 24.7℃。
After the test,the batteries are no leakage,no venting, no disassembly, no rupture and no fire.
Ambient temperature:24.7℃.

Test T.3: 振动 Vibration

测试方法 Test method:
电池组紧固在振动机平面上，正弦波形振动，频率在 7 和 200 赫兹之间摆动再回到 7 赫兹的对数扫频为时 15 分钟。这一振动过程须对三个互相垂直的电池安装方位的每一个方向都重复进行 12 次，总共为时 3 小时。其中一个振动方向必须与端面垂直。
对数扫频为：从 7 赫兹开始保持 1gn 的最大加速度直到频率达到 18 赫兹。然后将振幅保持在 0.8 毫米(总偏移 1.6 毫米)并增加频率直到最大加速度达到 8gn(频率约为 50 赫兹)。将最大加速度保持在 8gn 直到频率增加到 200 赫兹。
Batteries are firmly secured to the platform of the vibration machine ,The vibration is a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.
The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 g_n occurs (approximately 50 Hz). A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200 Hz.
要求 Requirement:
电池组如无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池组即符合这一要求。
Batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (g)	电压 Voltage (V)	质量 Mass (g)	电压 Voltage (V)			
第一个充放电周期完全充电 At first cycle in fully charged states	B01#	178.172	4.25	178.172	4.25	0.00	100.0	PASS
	B02#	178.512	4.25	178.512	4.25	0.00	100.0	PASS
	B03#	178.393	4.28	178.393	4.28	0.00	100.0	PASS
	B04#	178.336	4.24	178.336	4.24	0.00	100.0	PASS
五十个充放电周期后，完全充电 After 50 cycles ending in fully charged states	B05#	178.543	4.23	178.543	4.23	0.00	100.0	PASS
	B06#	178.521	4.24	178.521	4.24	0.00	100.0	PASS
	B07#	178.410	4.23	178.410	4.23	0.00	100.0	PASS
	B08#	178.192	4.24	178.192	4.24	0.00	100.0	PASS

备注 Notes:
试验后电池组无渗漏、无排气、无解体、无破裂和无燃烧，环境温度 24.8℃。
After the test,the batteries are no leakage,no venting, no disassembly, no rupture and no fire.
Ambient temperature:24.8℃.

Test T.4:冲击 Shock

测试方法 Test method:
电池组用坚硬支架紧固在试验装置上，支架支撑着每个试验电池组的所有安装面。每个电池组经受最大加速度 150gn 和脉冲持续时间 6 毫秒的半正弦波冲击。每个电池组在三个互相垂直的电池组安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受 18 次冲击。
Batteries are secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each battery is subjected to a half-sine shock of peak acceleration of 150 g_n and pulse duration of 6 milliseconds. Each battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the battery for a total of 18 shocks.
要求 Requirement:
电池组如无渗漏、无排气、无解体、无破裂和无燃烧，并且每个试验电池或电池组在试验后的开路电压不小于其在进行这一试验前电压的 90%，电池组即符合这一要求。
Batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test battery after testing is not less than 90% of its voltage immediately prior to this procedure.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	试验前 Pre-test		试验后 After test		质量损失 Mass loss (%)	电压比 Voltage after test/Voltage pre-test(%)	判定 Status
		质量 Mass (g)	电压 Voltage (V)	质量 Mass (g)	电压 Voltage (V)			
第一个充放电周期完全充电 At first cycle in fully charged states	B01#	178.172	4.25	178.172	4.25	0.00	100.0	PASS
	B02#	178.512	4.25	178.512	4.25	0.00	100.0	PASS
	B03#	178.393	4.28	178.393	4.28	0.00	100.0	PASS
	B04#	178.336	4.24	178.336	4.24	0.00	100.0	PASS
五十个充放电周期后，完全充电 After 50 cycles ending in fully charged states	B05#	178.543	4.23	178.543	4.23	0.00	100.0	PASS
	B06#	178.521	4.24	178.521	4.24	0.00	100.0	PASS
	B07#	178.410	4.23	178.410	4.23	0.00	100.0	PASS
	B08#	178.192	4.24	178.192	4.24	0.00	100.0	PASS

备注 Notes:
试验后电池组无渗漏、无排气、无解体、无破裂和无燃烧，环境温度 23.8℃。
After the test,the batteries are no leakage,no venting, no disassembly, no rupture and no fire.
Ambient temperature:23.8℃.

Test T.5:外部短路 External short circuit

测试方法 Test method:
电池组的温度稳定后使其外壳温度达到 55±2℃，然后电池组在 55±2℃下经受总外阻小于 0.1 欧姆的短路条件。短路条件持续到电池组外壳温度回到 55±2℃后继续至少 1 小时，再观察 6 小时结束试验。
Batteries be tested are temperature stabilized so that its external case temperature reaches 55 ± 2 °C and then the battery are subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 55 ± 2 °C. This short circuit condition is continued for at least one hour after the battery external case temperature has returned to 55 ± 2 °C. The batters are observed for a further six hours for the test to concluded.
要求 Requirement:
外壳温度如不超过 170℃，并且在试验过程后 6 小时内无解体、无破裂、无起火，电池组即符合这一要求。
Batteries meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire within six hours after test.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	最高温度 Highest temperature（℃）	判定 Status
第一个充放电周期完全充电 At first cycle in fully charged states	B01#	55.4	PASS
	B02#	55.5	PASS
	B03#	55.5	PASS
	B04#	55.1	PASS
五十个充放电周期后，完全充电 After 50 cycles ending in fully charged states	B05#	55.5	PASS
	B06#	55.6	PASS
	B07#	55.2	PASS
	B08#	55.7	PASS

备注 Notes:
试验后电池组 6 小时内无解体、无破裂、无起火，环境温度 24.4℃。
After the test,the batteries are no disassembly ,no rupture and no fire within six hours.
Ambient temperature:24.4℃.

Test T.6:撞击/挤压 Impact/Crush

撞击 Impact(applicable to cylindrical cells not less than 18mm in diameter)

测试方法 Test method;
试样电池或元件电池放在平坦光滑的表面上，一根316型不锈钢棒横放在试样中心，钢棒直径15.8mm±0.1mm，长度至少6cm，或电池最长端的尺度，取二者之长者，将一块9.1kg±0.1kg的重锤从61cm±2.5cm高处跌落到钢棒和试样交叉处，使用一个几乎没有摩擦的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿与水平支撑表面呈90度落下。
接受撞击的试样，纵轴应与平坦表面平行并与横放在试样中心的直径15.8mm±0.1mm完全表面的纵轴垂直、每一试样只经受一次撞击。
The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ±0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg ± 0.1 kg mass is to be dropped from a height of 61 ± 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.
The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm ± 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

挤压/Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells not more than 18 mm in diameter)

测试方法 Test method;
将电池或元件电池放在两个平面之间挤压，挤压力度逐渐加大，在第一个接触点上的速度大约为1.5厘米/秒，直到出现下列的情况之一;
Cells or componert cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact, The crushing is to be continued until the first of the three options below is reached.

(a) 施加的力量达到13千牛±0.78千牛;
The applied force reaches 13 kN ± 0.78 kN;
(b) 电池的电压下降至少100mV；或
The voltage of the cell drops by at least 100 mV; or
(c) 电池变形达原始高度的50%或以上。
The cell is deformed by 50% or more of its original thickness.

要求 Requirement;
外壳温度如不超过170℃，并且在试验过程中及试验后6小时内无解体、无破裂、无起火，电池或元件电池即符合这一要求。
Cells or componert cell meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly,no rupture and no fire during the test and within six hours after test.

测试数据如下表 Test Date showed in table below;

样品状态 State of sample	测试项目 Test item	序号 No.	判定 Status
一个充放电周期 50%设计额定容量 状态 At first cycle at 50% of the design rated capacity	挤压 Crush	C09#	PASS
		C10#	PASS
		C11#	PASS
		C12#	PASS
		C13#	PASS

备注 Notes:
电池或元件电池在试验过程中和试验后 6 小时内无解体、无破裂、无起火，环境温度 24.5℃。
Cells or componert cell are no disassembly and no fire during the test and within six hours after test.
Ambient temperature:24.5℃.

Test T.7:过充电 Overcharge

测试方法 Test method:
充电电流为制造商建议的最大持续充电电流的两倍，试验的最小电压如下：

a) 制造商建议的充电电压不大于 18V 时，试验的最小电压应是电池组最大充电电压的两倍或 22V 两者的较小者。
when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

b) 制造商建议的充电电压大于 18V 时，试验的最小电压应是电池组最大充电电压的 1.2 倍。
when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

试验在环境温度下进行，进行试验时间为 24 小时。
Tests are to be conducted at ambient temperature. The duration of the test is 24 hours.
要求 Requirement:
充电电池组如在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。
Batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

测试数据如下 Test Date showed in table below:

过充电流 Overcharge current: 2×5200mA=10400mA	过充电压 Overcharge voltage : 2×4.35V=8.70V	充电总时间 Total time of charging: 24hours
样品状态 State of sample	序号 No.	判定 Status
第一个充放电周期后完全充电 At first cycle in fully charged states	B01#	PASS
	B02#	PASS
	B03#	PASS
	B04#	PASS
五十个充放电周期后，完全充电 After 50 cycles ending in fully charged states	B05#	PASS
	B06#	PASS
	B07#	PASS
	B08#	PASS

备注 Notes:
电池组在试验过程中和试验后 7 天内无解体、无起火，环境温度 24.5℃。
The Batteries are no disassembly and no fire during the test and within seven days after the test,Ambient temperature:24.5℃.

Test T.8:强制放电 Forced discharge

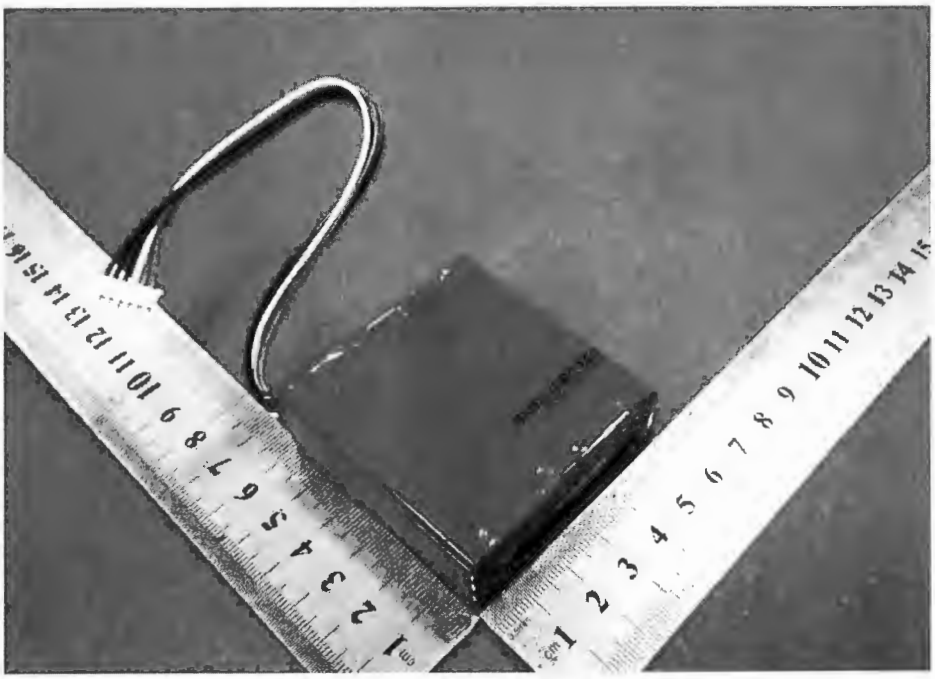
测试方法 Test method:
电池在环境温度下与 12V 直流电电源串联在起始电流等于制造商给的的最大放电电流条件下强制放电。
Each component cell is forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.
要求 Requirement:
充电电池如在试验过程中和试验后 7 天内无解体，无起火，即符合本项要求。
Rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

测试数据如下表 Test Date showed in table below:

样品状态 State of sample	序号 No.	判定 Status
第一个充放电周期后完全放电 At first cycle in fully discharged states	C14#	PASS
	C15#	PASS
	C16#	PASS
	C17#	PASS
	C18#	PASS
	C19#	PASS
	C20#	PASS
	C21#	PASS
	C22#	PASS
	C23#	PASS
五十个充放电周期后，完全放电 After 50 cycles ending in fully discharged states	C24#	PASS
	C25#	PASS
	C26#	PASS
	C27#	PASS
	C28#	PASS
	C29#	PASS
	C30#	PASS
	C31#	PASS
	C32#	PASS
	C33#	PASS

备注 Notes:
试验后元件电池在试验过程中和试验后 7 天内无解体、无起火，环境温度 24.6℃
After the test,the Component cells are no disassembly and no fire during the test and within seven days，Ambient temperature:24.6℃.

样品照片 Photo document



图片 Photo 1

图片 Photo 2

样品照片 Photo document

图片 Photo 3

图片 Photo 4

声　明

STATEMENT

1. 本实验室是经过中国合格评定国家认可委员会认可的检测实验室，证书号：L1659。

   This test laboratory is accredited by CNAS,Accreditation Certificate No.L1659.

2. 报告未加盖“检测专用章”无效。

   The test report is invalid without stamp of laboratory.

3. 报告无检测、批准人员签字无效。

   The test report is invalid without signature of person(s) testing and authorizing.

4. 报告涂改无效。

   The test report is invalid if erased and corrected.

5. 自送样品的检测结论仅对送检样品有效。

   Test results of the report is valid to the test samples if sampling by client.

6. CNAS 未涉及“☆”的项目。

   “☆” item cannot be Accredited by CNAS.

7. 未经本实验室书面同意，不得部分地复制本报告。

   The test report shall not be reproduced except in full, without written approval of the laboratory.

8. 如对本报告有异议，可在收到报告后 15 天内向本单位申诉，逾期不予受理。

   If there is any objection to report,the client should inform issuing laboratory within 15 days from the date of receving test report.

地　址：广东省深圳市南山区西丽街道西丽工业区石鼓东 28、29 栋　　邮政编码/P.C.：518055
Address：Building 28、29, Shigu east, Xili Factory District, Xili Road, Nanshan District, ShenZhen, Guangdong, China
电话/TEL：86-755-26628136　　传真/FAX：86-755-26701436
网址/Internet：http:// www.ccic-set.com　　电子信箱/E-Mail：sophie.wang@ccic-set.com

AF-312C

ABS : Flame retardant Grade

Application

(TBBA flame retardants)TV, VTR, printer, facsmilie, computer, monitor . Electric parts requiring flame retardant property.

Feature

AF-312C is specifically engineered to meet the need for high performance products in the flame retardant resin applications. AF-312C provides an optimum balance of physical properties,high heat resistance,outstanding UV stability and good finished part aesthetics.

Properties

Physical	Method	Condition	Unit	Value
Melt Index	ASTM D1238	200℃/5kg	g/10min	6.5
	ASTM D1238	220℃/10kg	g/10min	55
	ASTM D1238	230℃/3.8kg	g/10min	16
Specific Gravity	ASTM D792	23℃	-	1.18
Mold Shrinkage	ASTM D955	-	%	0.4~0.7

Mechanical	Method	Condition	Unit	Value
Tensile Strength at Yield	ASTM D638	50mm/min	kg/㎠	440
Tensile Modulus	ASTM D638	50mm/min	kg/㎠	22,000
Elongation at Yield	ASTM D638	50mm/min	%	5
Elongation at Break	ASTM D638	50mm/min	%	20
Flexural Strength	ASTM D790	15mm/min	kg/㎠	710
Flexural Modulus	ASTM D790	15mm/min	kg/㎠	25,000
IZOD Impact strength	ASTM D256	1/4",23℃	kg·cm/cm	25
	ASTM D256	1/4",-30℃	kg·cm/cm	8
	ASTM D256	1/8",23℃	kg·cm/cm	31
	ASTM D256	1/8",-30℃	kg·cm/cm	8

Thermal	Method	Condition	Unit	Value
Heat Deflection Temp	ASTM D648	1/4",18.5kg/㎠ (unannealed)	℃	74
	ASTM D648	1/4",4.6kg/㎠ (annealed)	℃	88
	ASTM D648	1/4",4.6kg/㎠ (unannealed)	℃	84
		1/4",18.5kg/㎠		

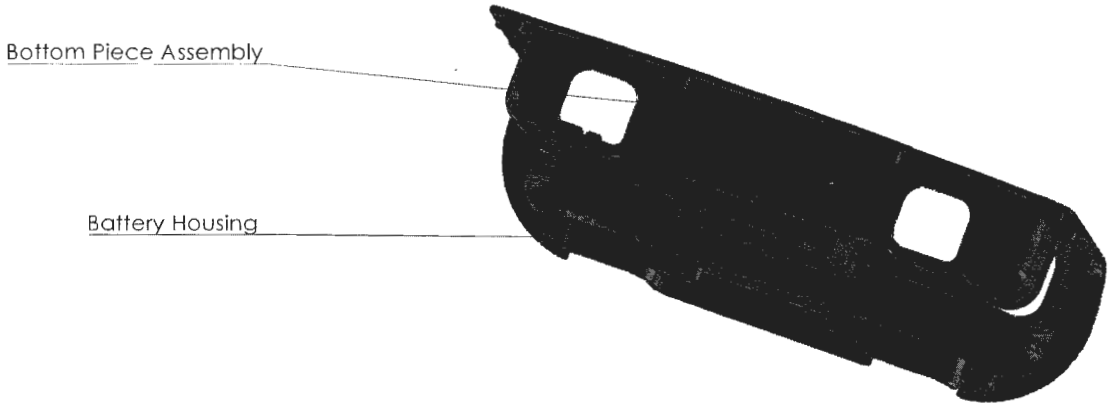
	ASTM D648	(annealed)	°C	83

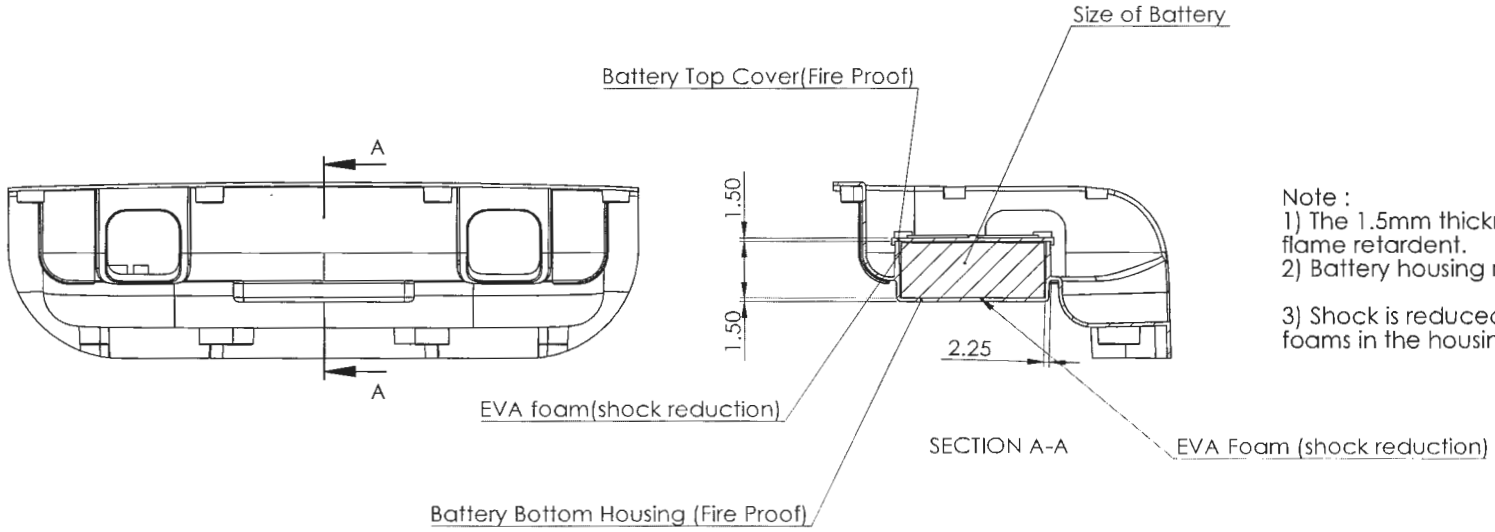
Flammability	Method	Condition	Unit	Value
Flammability	UL94	1/10"	class	V-0

LG Chem Fax:82-2-3773-7802 | Email:lgwebmaster@lgchem.com

REVISIONS

REV	Description :	Drawn by :	Date :





Note :
1) The 1.5mm thickness ABS plastic housing is flame retardent.
2) Battery housing material is ABS AF312C

3) Shock is reduced by adding the EVA foams in the housing.

Item :	Descriptions :	Specification :	Material :	Qty :	Remark :

bluesmart

Tolerence unless otherwise stated :

X.X ±0.2
X.XX ±0.10
X.XXX ±0.050
Angels ±0.5°

Bluesmart part name : Cabin_Bottom_Piece

Bluesmart part No :

Material : ABS AF312C

UNIT: MM

Scale : 1:2

Approved by : MD

Project name : Cabin

Date : 2016-06-08

Designer : EZ

SHT No :

REV :

A3

AUTOMATIC CONTROL FOR RADIO FREQUENCY COMPLIANCE

Bluesmart

Abstract

In this brief document, we present the sensors and algorithms used by the Carry-on developed by Bluesmart to assure that the onboard wireless module complies with current federal regulations. A real flight case study is presented.

I. INTRODUCTION

The carry-on developed by Bluesmart (CO-01), is different from other wireless communication devices i.e. cellular phones, in the main fact that the cellular network is used at intervals, rather than, being constantly connected and sending-receiving information. To assure that the CO-01 is safe and does not interfere with any airplane communication and/or navigation instruments we develop a set of algorithms and rules that prevent the CO-01 to broadcast data or connect to the network while the aircraft is in flight. For the purpose of this document we will use the following definition of in-flight: "Any time from the moment all the external doors of an aircraft are closed following embarkation until the moment when any such door is opened for disembarkation[...]".[1] Next we will present the sensors used and its characteristics. Then we described the process "Crosscheck" used to inhibit wireless communication while flying. Finally an example of a real flight is shown with the automatic detections performed with the computer onboard the luggage.

II. SENSORS

A set of sensors are used to identify the different parts of the flight. A 3-axis accelerometer, a barometer, a thermometer and a clock are embedded in the CO-01. Next we present the Barometer.

A. Barometer

The barometer, an IC used to measure pressure, with this data altitude can be computed. The barometer is heavily affected by noise, bias and drift. Sample data for a static case is shown in fig. 2. To reduce the effect of the noise an Infinite Impulse Response filter is used to obtain a better measurement. A comparison between this two values are shown in fig. 2. The barometer will be used in two scenarios. The first scenario is to assure that whenever the aircraft closes the doors the cellular functions (if being used) are immediately terminated, and disabled. In the second scenario, will determine if the movement in the aircraft is ascending or descending.

B. Accelerometer

The second sensor available is a three axis accelerometer. With this sensor the acceleration in three axis of the CO-01 can be meassured. This sensor as well is very noise and a filter is used to obtain a pristine value. A sample filtered data is shown in fig. 3. We calibrate the accelerometer before we use it. In the next section we present and discuss the "crosscheck".

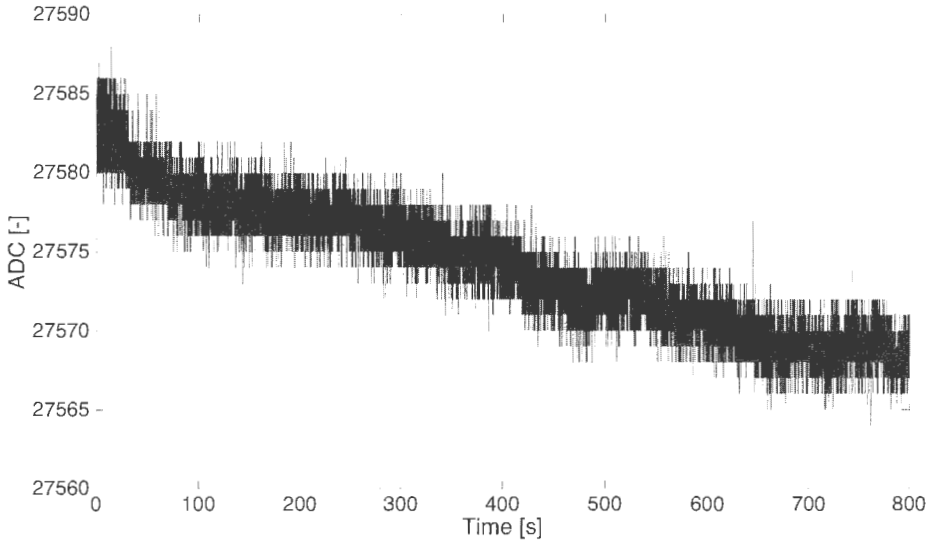


Fig. 1. Barometer sample raw data

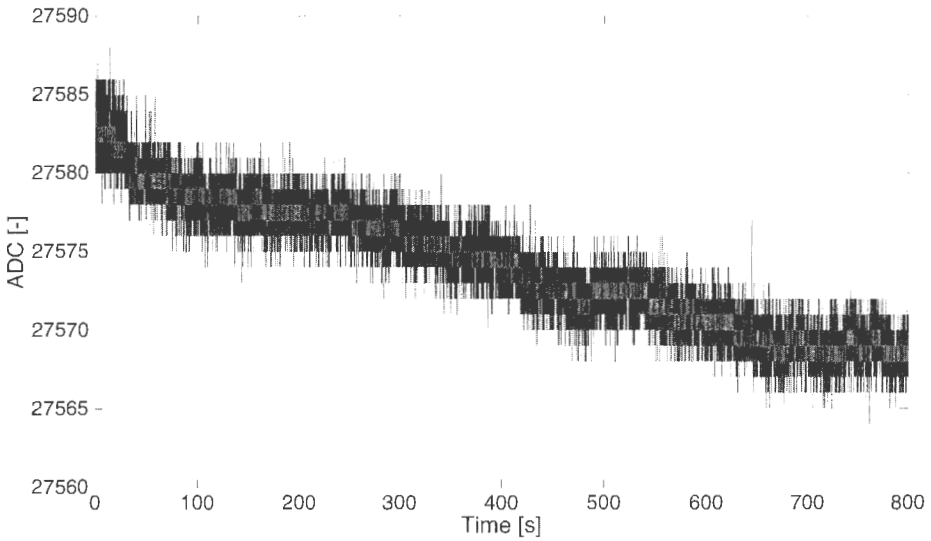


Fig. 2. Barometer fitlered data

III. CROSSCHECK

The main objective of the crosscheck algorithm is to disable wireless communications when the aircraft is on the air. The accelerometer is used to detect large accelerations changes. This large accelerations indicate that the aircraft is changing its movements. This movements will indicate, increase in speed, decrease in speed, increase in altitude, decrease in altitude or attitude changes. The barometer is used to characterize the type of movement detected with the accelerometer. If the pressure increase, will indicate altitude lose. With pressure decrease will indicate and increment in altitude. Spikes in pressure indicates attitude changes. No variations on pressure indicates linear speed changes. We use mathematical methods[2]

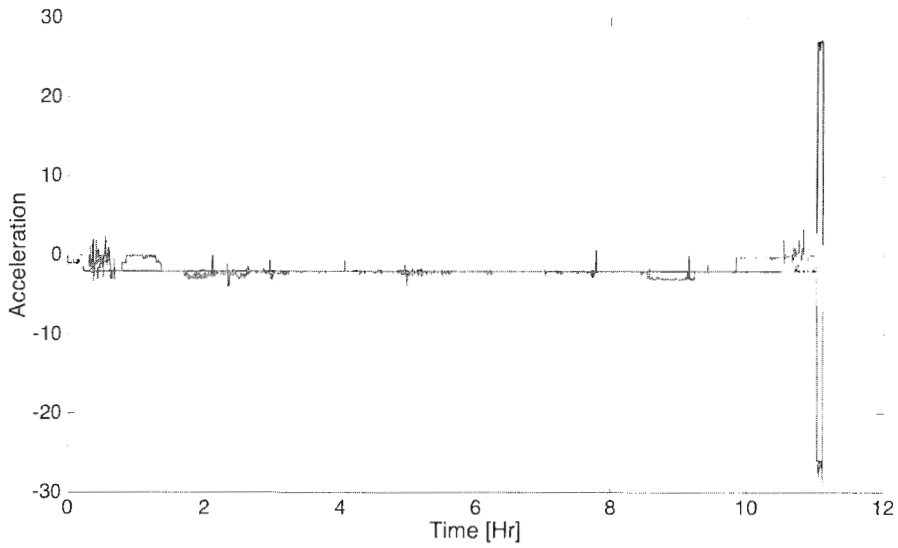


Fig. 3. Accelerometer measurements

to detect the different edges on the curve. With this curves and comparing to the patterns of the aircraft we identify if the aircraft is on the air or not. The aircraft is identified as being in flights after the accelerometer detect the increase in the acceleration during take off followed by the pressure drop due to the climbing. Once the acceleration is detected the communications are inhibited to prevent the wireless communications to go off during takeoff. The The main drawback of this method is that will fail to prevent wireless emissions from the moment the door close to the moment where the take off run stars. To prevent wireless communication in this periods of time we use a background check.

The Background check is used to sample the barometer and intervals to verify that the door has not been close. To identify the door close an abrupt change in the pressure output will occur. When this jump occurs the communications are inhibited as to prevent wireless communications. Once the flag of door-close is set the communications are inhibited and the crosscheck process continues as stated above. A plot showing an example of real door close is shown in fig. 4.

The algorithms discussed above are implemented in the embedded computer inside the CO-01. These algorithms are constantly running in the background to assure that the crosscheck can function regardless of the user intervention and travel schedule. The algorithms are implemented to run on real time, hence the data is being discarded as soon as is processed to protect the users privacy. For the purpose of debug some CO-01 where modified as to record the entire data and different flight moments identifications. A sample trial from a real flight is shown in fig. 5. The plot is for a 10:00 Hr flight. There are two zones clearly marked. In blue, are the areas that represent the aircraft on the ground with the door open. In red, from door close till door open. These sections where identified with the crosscheck algorithm automatically.

IV. CONCLUSIONS

First we presented the sensors incorporated in the Carry-on developed by Bluesmart. Then, the different algorithms used to assure that no wireless communications are performed during flight were introduced. Finally, sample data from a real flight where shown. From the data shown is clear that the algorithm presented in this brief document clearly can capture the flight of the aircraft. With this algorithms the wireless communications are effectively inhibited during the flight of the aircraft. This assure that the Carry-on is safe to be carry on any aircraft.

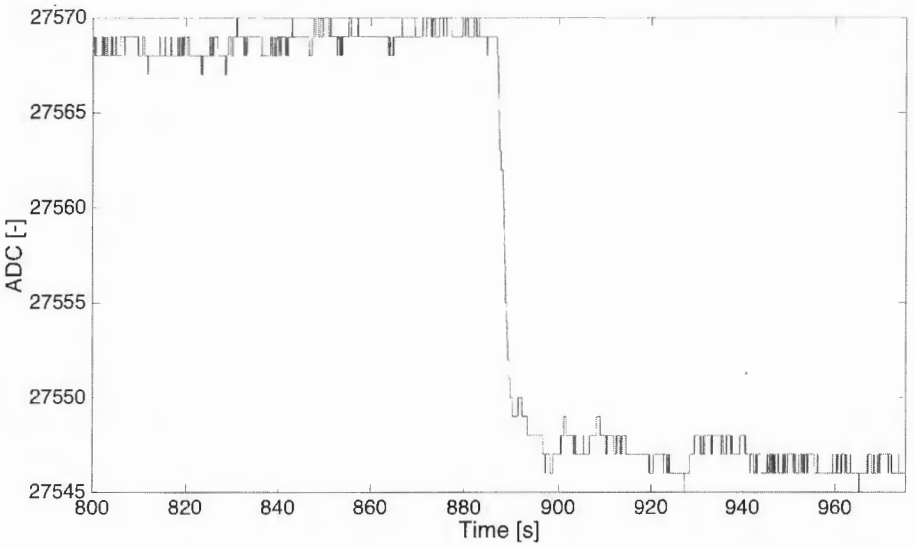


Fig. 4. Door close sample data

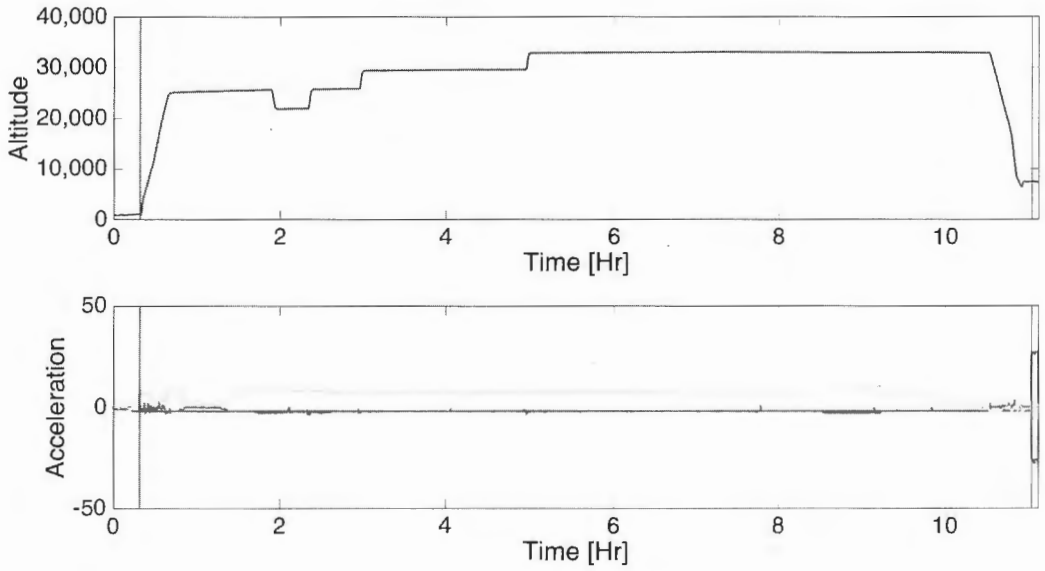


Fig. 5. Door close sample data

REFERENCES

[1] F. A. Regulation, "Part 01," *DEFINITIONS AND ABBREVIATIONS*, 1990.

[2] W. Swokowski, *Calculus*, ser. Available Titles Cengagenow. Brooks/Cole, 1991.