

# JSON Specification Section Supplement

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The following supplemental requirements are in addition to language contained in contract solicitations and are equally binding.

## 1 General System Requirements

1.1 Security. Data must be secured between the tracking unit and the AFF NOC. A minimum of 128 bit Secure Socket Layer will be used between the vendor NOC and the AFF NOC.

The vendor NOC shall have an executed Interconnection Security Plan (ISP) (see Exhibit 1) between the vendor NOC and the Government.

1.2 Quality. Only valid 3D position reports will be used for tracking. Reports with DOPs greater than 0 or less than 98 will be deemed valid.

1.3 Latency. Position reports must be delivered to the AFF NOC in less than 2 minutes of the position report time.

1.4 Frequency. Tracking unit will report a minimum of one position every two minutes.

1.5 System Health Validation. One source of validation data are required (referred to as "heartbeat").

1) One valid end-to-end position report is required from a tracking unit using the same hardware and satellite segment as production tracking units every 5 to 10 minutes to verify that the system is working from end-to-end. New firmware may be tested using the end-to-end unit.

1.6 Consistency. The number of missing/invalid position reports from a tracking unit must not exceed 0.2% in any 5 minute block, and 0.1% in any 10 minute block on a 7-day running average.

1.7 Scheduled and unscheduled changes and outages. AFF will be notified of system changes, scheduled maintenance and planned or unplanned service outages via [affadmin@firenet.gov](mailto:affadmin@firenet.gov).

## 2 Data Types and Precision for Aircraft Tracking Units

This specification section addresses minimum requirements of an individual position report.

The tracking unit must generate and calculate all positional data specified below from GPS. Data units may be reformatted at the vendor NOC before delivery to AFF NOC (e.g. latitude /longitude may be transmitted from tracking units in Degrees Minutes and Seconds to the vendor NOC, then reformatted to decimal degrees for delivery to AFF NOC).

2.1 (Equipment Serial Number) will be embedded in the position report by the tracking device. No lookup or pivot tables shall be used for this value when generating JSON. The IMEI may be used as the ESN.

2.2 Date/Time will be the UTC time of the GPS position report.

2.3 Latitude\* and Longitude\* will be decimal degrees.

2.4 Altitude\* will be Meters from Mean Sea Level.

2.5 Speed\* will be Meters per Second.

2.6 Heading\* will be track over ground from True North reported in degrees.

\* Position data coordinate system will be Geodetic Latitude / Longitude, WGS 1984 datum. GPS and position report must be capable of reporting its position to with +- 100 Meters.

2.7 Fix Type calculated by the GPS unit. Valid values are:

- 3D
- 2D
- Invalid

2.8 Position Quality metrics can be any of the following combination of precision:

- Position Dilution of Precision (PDOP)
- Horizontal Dilution of Precision (HDOP)

2.9 Table of data types and precision

Description	Data Type
Equipment Serial Number	String
Date Time	DateTime
Latitude	Double
Longitude	Double

Speed	Integer
Heading	Integer
Altitude	Integer
Fix Type	String
PDOP	Double
HDOP	Double

Real values may be rounded to create an Integer Value Type.

### 3 Data Storage, Delivery Method, Frequency

This specification section addresses minimum requirements for the vendor's data center. (NOC)

3.1 Storage. Data will be stored at the vendor NOC for a minimum of 14 days.

3.2 Delivery Method. HTTPS will be used for data exchange. Post method will be used to request data.

3.3 Authentication: The request page will be username and password protected. HTTP Basic Authentication (BA) will be used.

3.4 Frequency. The AFF server will request data no more frequently than every 15 seconds.

3.5 Data Format. Data will be formatted into a well-formed JSON format as defined in JSON Appendix 2. (Sample Query, Position Report, and Error JSON document is in JSON Appendix 2.)

3.6 Bandwidth. The vendor NOC must be able to deliver all position data over a 60 second interval in less than 30 seconds from time of request. AFF NOC will have three to six servers requesting position reports. AFF NOC data requests will not be synchronized.

3.7 Vendor NOC must be operational 99.9% on a 7-day running average based on the vendor's heartbeat at a 10 minute interval. (No more than one 20 minute outage in seven consecutive days)

## Appendix 1—Definitions

<b>Acronym</b>	<b>Definition</b>
2D	Two-dimensional position report
3D	Three-dimensional position report
DOP	Dilution of Precision
ESN	Equipment Serial Number
HTTPS	Hypertext Transfer Protocol Secure
IMEI	International Mobile Equipment Identity
JSON	JavaScript Object Notation
NOC	Network Operations Center(s)
SSL	Secure Socket Layer
UTC	Universal Time Coordinate
WGS	World Geodetic System

## Appendix 2— Automated Flight Following (AFF) JSON Format Specification Version 1.0

The AFF JSON position document is an extension of the:  
GeoJSON Format Specification  
Revision 1  
16 June 2008.

All AFF JSON position documents should conform to GeoJSON standard and include the "dataInfo" object in each document and a "properties" object for each "type": "Feature".

### Data Dictionary for AFF Position Reports

Key	Value	Description	type	required
<b>type</b>	FeatureCollection		string	y
<b>dataInfo</b>			array	y
<b>affVer</b>			string	y
<b>provider</b>		Hardware and Data vendor (Must be one stop shopping)	string	y
<b>rptTime</b>		Time system created report	dateTime ISO 8601	y
<b>sysId</b>		Name of data center providing report		n
<b>features</b>		Array of geojson objects	array	y
<b>type</b>	Feature		string	y
<b>properties</b>		geojson "properties" object	object	y
<b>rpt</b>	pos	report type	string	y
<b>esn</b>		hardware unique identifier - may not be lookup value	string	y
<b>unitId</b>		canonical name (e.g. registration number)	string	n
<b>cog</b>		Course over Ground, True North	integer	y
<b>spd</b>		Speed	integer	y
<b>src</b>	GPS/Glonas/Gallileo/Ioran	System used to calculate position	string	y
<b>fix</b>	invalid/2D/3D	Position fix type	string	y

Key	Value	Description	type	required
<b>pdop*</b>		Position dilution of precision	Double	y
<b>hdop**</b>		Horizontal dilution of precision	Double	n
<b>vdop</b>		Vertical dilution of precision	Double	n
<b>tdop</b>		Time dilution of precision	Double	n
<b>posTime</b>		Time position was calculated.	dateTime ISO 8601	y
<b>dataCtrTime</b>		Time position reports was inserted into vendor database.	dateTime ISO 8601	y
<b>ctrlId</b>		vendor server reporting position	string	n
<b>geometry</b>			object	y
<b>type</b>	Point		string	y
<b>coordinates</b>	longitude,latitude,altitude	geojson "coordinates" array Decimal degrees.  Altitude in meters msl/hae	array	y

\* Equipment (purchased before 2016) may continue to use hdop values if no pdop available.

\*\* Equipment purchased in 2016 and after should use pdop.

## Data Dictionary for data collected by ATU

The additional ATU event fields required to be sent with the properties key are labeled with an \* (see example below table).

Up to four different objects (aircraft, tank, bucket, hardware) can be included inside an “events” object.

Multiple unique key value pairs may be included inside each of the events object keys.

Key	Value	Definition	Event	Type
<b>atu</b>	*		N/A	object
<b>firmware</b>	*version		state	string
<b>esn</b>	*string	Imbedded identifier from the device (e.g. IMEI)	state	string
<b>events</b>	*		N/A	object
<b>aircraft</b>			N/A	object
<b>tank</b>			N/A	object
<b>bucket</b>			N/A	object
<b>hardware</b>			N/A	object
<b>power</b>	on	Aircraft power on	N/A	string
<b>power</b>	off	Aircraft power off	N/A	string
<b>oilPress</b>	true/false	Device recording start of engine based on engine oil pressure	transition	boolean
<b>status</b>	takeoff	Aircraft takeoff for fixed wing aircraft speed change to greater than 40 knots. Only one takeoff event per flight; first transition.	transition	string
<b>status</b>	landing	Aircraft landing for fixed wing aircraft change of speed from greater than 40 knots to less than or equal to 40 knots. Only one takeoff event per flight; first transition.	transition	string
<b>status</b>	inflight	Fixed wing aircraft in flight where speed is greater than 40 knots.	state	string
<b>wow</b>	on	Weight on wheels, aircraft is landed	transition	string
<b>wow</b>	off	Weight off wheels, aircraft is in flight	transition	string

Key	Value	Definition	Event	Type
gear	up	Landing gear transition change from down to up	transition	string
gear	down	Landing gear transition change from gear up to gear down	transition	string
fill	start	Onloading of fire suppressant	transition	string
fill	end	Stop loading fire suppressant	transition	string
pump	start	Fill start when using a snorkel pump	transition	string
pump	end	Fill end when using a snorkel pump	transition	string
drop	start	Sensor generated start of dropping fire suppressant	transition	string
drop	end	Sensor generated end of dropping fire suppressant	transition	string
suppressant	retardant	Suppressant type of retardant	state	string
suppressant	foam		state	string
suppressant	water		state	string
suppressant	gel		state	string
suppressant	ukn	unknown	state	string
gallons	integer	Volume of suppressant in U.S. gallons	state	integer
liters	integer	Volume of suppressant in metric liters	state	integer
coverageLvl	Integer	Coverage level selected on drop controller	state	integer
firmwareUpdate	dateTime	ISO 8601 for firmware version change	transition	dateTime
calibration	dateTime	ISO 8601	transition	dateTime



## Example AFF Position Report

```
{
  "dataInfo": [
    {
      "affVer": "json 1.0",
      "provider": "Company A",
      "rptTime": "2016-02-05T22:26:05Z",
      "sysId": "dataCtrlId"
    }
  ],
  "type": "FeatureCollection",
  "features": [
    {
      "type": "Feature",
      "properties": {
        "cog": 0,
        "ctrlId": "dataCtrlId",
        "dataCtrTime": "2016-02-05T22:25:09Z",
        "esn": "012345",
        "fix": "3D",
        "hdop": 0,
        "pdop": 0,
        "posTime": "2016-02-05T22:25:09Z",
        "rpt": "fea1",
        "spd": 0,
        "src": "GPS",
        "unitId": "Heartbeat"
      },
      "geometry": {
        "coordinates": [
          -117.2708,
          32.84929,
          151
        ],
        "type": "Point"
      }
    }
  ]
}
```

## Example AFF Position with ATU Event

```
{
  "type": "FeatureCollection",
  "dataInfo": [
    {
      "affVer": "json 1.0",
      "provider": "Company A",
      "rptTime": "2014-08-02 05:55:04Z",
      "sysId": "serverId-02"
    }
  ],
  "features": [
    {
      "type": "Feature",
      "properties": {
        "atu": {
          "events": {
            "aircraft": {
              "status": "landing"
            }
          }
        }
      },
      "rpt": "pos",
      "esn": "012345",
      "unitId": "1001",
      "cog": 66,
      "spd": 0,
      "src": "GPS",
      "fix": "3D",
      "pdop": 1,
      "hdop": 1,
      "vdop": 1,
      "tdop": 1,
      "posTime": "2014-08-02T05:44:40Z",
      "dataCtrTime": "2014-08-02T05:44:40Z",
      "ctrlId": "server1"
    },
    "geometry": {
      "type": "Point",
      "coordinates": [
        -117.2708,
        32.84929,
        151
      ]
    }
  ]
}
```

### Example of Data Request:

```
{
  "type": "dataRequest",
  "dataCenter": [
    {
      "affVer": "json 1.0",
      "name": "AFF",
      "reqTime": "2014-08-02T05:56:04Z"
    }
  ],
  "msgRequest": [
    {
      "to": "CompanyA",
      "from": "AFF",
      "msgType": "dataRequest",
      "dataCtrTime": "2014-08-02T05:55:04Z"
    }
  ]
}
```

### Example of Error Response:

Values included in the “error” and “debug” keys should include information the Vendor will find helpful to isolate the cause and potential solution to the error condition. AFF records this information and on request sends it to vendor to help facilitate troubleshooting.

```
{
  "type": "FeatureCollection",
  "dataInfo": [
    {
      "affVer": "json 1.0",
      "provider": " Company A ",
      "rptTime": "2016-02-04T22:27:31Z",
      "sysId": "serverId-02"
    }
  ],
  "error": "Invalid request",
  "debug": {
    "reqMeth": "POST",
    "httpHost": "a.company.com",
    "httpAccept": null,
    "contType": "text/html;charset=UTF-8",
    "contLen": "249",
    "script": "/aff/index.php",
    "protocol": "HTTP/1.1",
    "referer": null
  }
}
```