



VFR FLIGHTPLAN EQUIPMENTS

1. Introduction

When filing a flightplan, aircraft operators are required to submit the list of equipment aboard their aircraft for declaring:

- Navigation capabilities dedicated to ATC management
- Regulatory equipments depending on flight type, flight rules...
- Type of advanced surveillance systems for airport and airspace infrastructures management.

In addition to these equipments which are instrument-related, operators are required to inform of the surveillance equipment aboard their aircraft, otherwise called transponders.

Radio and Navigation Equipment	Transponder Type
<input checked="" type="checkbox"/> S - Standard (VHF, VOR, ILS) <input type="checkbox"/> A - GBAS Ldg System <input type="checkbox"/> B - LPV <input type="checkbox"/> C - Loran C <input checked="" type="checkbox"/> D - DME <input checked="" type="checkbox"/> E1 - FMC WPR ACARS <input type="checkbox"/> E2 - D-FIS ACARS <input checked="" type="checkbox"/> E3 - PDC ACARS <input checked="" type="checkbox"/> F - ADF <input checked="" type="checkbox"/> G - GPS / GNSS <input checked="" type="checkbox"/> H - HF RTF <input type="checkbox"/> I - INS (Inertial nav) <input type="checkbox"/> Z - Other (specify in item 18 preceded by COM/NAV/OR DAT/)	<input type="radio"/> N - no transponder on board <input type="radio"/> A - Mode A only (no altitude reporting) <input type="radio"/> C - Mode C <input type="radio"/> E - mode S (with aircraft ID, pressure altitude and ADS-B) <input checked="" type="radio"/> H - mode S (with aircraft ID, pressure altitude and enhanced surveillance capability) <input type="radio"/> I - mode S (with aircraft ID, but without pressure altitude) <input type="radio"/> L - mode S (with aircraft ID, pressure altitude, ADS-B and enhanced surveillance capability) <input type="radio"/> P - mode S (with pressure altitude, but without aircraft identification) <input type="radio"/> S - mode S (with aircraft ID and pressure altitude) <input type="radio"/> X - mode S (without aircraft ID and pressure altitude)
<input checked="" type="checkbox"/> J1 - CPDLC ATN VDL Mode 2 <input type="checkbox"/> J2 - CPDLC FANS 1/A HFDL <input checked="" type="checkbox"/> J3 - CPDLC FANS 1/A VDL Mode 4 <input type="checkbox"/> J4 - CPDLC FANS 1/A VDL Mode 2 <input type="checkbox"/> J5 - CPDLC FANS 1/A SATCOM (INMARSAT) <input type="checkbox"/> J6 - CPDLC FANS 1/A SATCOM (MTSAT) <input type="checkbox"/> J7 - CPDLC FANS 1/A SATCOM (Iridium) <input type="checkbox"/> K - MLS <input type="checkbox"/> L - ILS	<input type="checkbox"/> M1 - ATC RTF SATCOM (INMARSAT) <input checked="" type="checkbox"/> M2 - ATC RTF (MTSAT) <input type="checkbox"/> M3 - ATC RTF (Iridium) <input type="checkbox"/> O - VOR <input type="checkbox"/> R - PBN (PBN/required in item 18) <input type="checkbox"/> T - TACAN <input type="checkbox"/> U - UHF RTF <input type="checkbox"/> V - VHF RTF <input checked="" type="checkbox"/> W - RVSM (FL290-FL410) <input type="checkbox"/> X - MNPS <input checked="" type="checkbox"/> Y - 8.33 kHz radio
<input type="checkbox"/> M1 - ATC RTF SATCOM (INMARSAT) <input checked="" type="checkbox"/> M2 - ATC RTF (MTSAT) <input type="checkbox"/> M3 - ATC RTF (Iridium) <input type="checkbox"/> O - VOR <input type="checkbox"/> R - PBN (PBN/required in item 18) <input type="checkbox"/> T - TACAN <input type="checkbox"/> U - UHF RTF <input type="checkbox"/> V - VHF RTF <input checked="" type="checkbox"/> W - RVSM (FL290-FL410) <input type="checkbox"/> X - MNPS <input checked="" type="checkbox"/> Y - 8.33 kHz radio	<input type="checkbox"/> B1 - ADS-B with dedicated out capability <input type="checkbox"/> B2 - ADS-B with dedicated in and out capability <input type="checkbox"/> U1 - ADS-B out capability using UAT <input type="checkbox"/> U2 - ADS-B in and out capability using UAT <input type="checkbox"/> V1 - ADS-B out capability using VDL Mode 4 <input type="checkbox"/> V2 - ADS-B in and out capability using VDL Mode 4 <input checked="" type="checkbox"/> D1 - ADS-C with FANS 1/A capabilities <input type="checkbox"/> G1 - ADS-C with ATN capabilities

In this particular documentation, the following subjects will be dealt with:

- Common general aviation equipments including descriptions and goals,
- Required equipments for VFR flights as per regulations,
- Methodology to establish present equipments in an aircraft based on several examples of VFR aircraft, more or less sophisticated.

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2. Common VFR flight equipment

2.1. Radio and Navigation

The table below regroups the radio and navigation equipments commonly found in VFR-dedicated aircrafts.

Letter	Description
D	Distance Measuring Equipment (DME) is a transponder-based radio navigation technology that measures distance between the equipment on ground and an aircraft by timing the propagation delay of VHF or UHF radio signals.
F	Automatic Direction Finder (ADF) is a radio-navigation instrument that automatically and continuously displays the relative bearing from the aircraft to a suitable radio station.
G	Global Navigation Satellite System (GNSS). The term GNSS encompasses all the satellite navigation systems such as GPS, GLONASS, GALILEO.
L	Instrument Landing System (ILS) is a ground-based instrument approach system that provides precision guidance to an aircraft approaching and landing on a runway.
N	It shall be specified if no COM/NAV approach aid equipment for the route to be flown is carried, or the equipment is unserviceable.
O	VHF Omni directional Range (VOR) is a type of radio navigation system for aircraft. The system relies on ground based transmitters which emit signals to a VOR receiver inside the aircraft. The navigation signal allows the aircraft receiving equipment to determine a magnetic bearing from the station to the aircraft.
R	Performance Based Navigation (PBN) levels that can be met. It is used by ATC for clearance and routing purposes. The insertion of R in the field 10a requires PBN/ to be present in field 18. The PBN sub-field contains the RNAV and/or RNP certifications and operational approvals.
S	It shall be specified if standard COM/NAV/approach aid equipment for the route to be flown is carried and serviceable. If the letter S is used, standard equipment is considered to be VHF RTF, VOR and ILS unless another combination is prescribed by the appropriate ATS authority.
V	Very High Frequency (VHF) Radio Telephone (RTF). Radio equipment onboard the aircraft.
Y	Very High Frequency (VHF) with 8.33 kHz spacing channel: it was decided in 1994 to introduce a further channel split from 25 kHz to 8.33 kHz.

Rule: Standard (S) equipment regroups following equipment: VOR(O) + ILS(L) + VHF(V).

S = LOV

S equipment will replace LOV in the flight plan declaration; you may not declare LOV with combination with S. S equipment should be inserted as first letter in the flight plan equipment section.

Caution: this table is not dealing with versatile aircrafts and IFR-dedicated instruments.

Please refer to the dedicated to documentation for IFR-oriented aircrafts.

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2.2. Transponder type

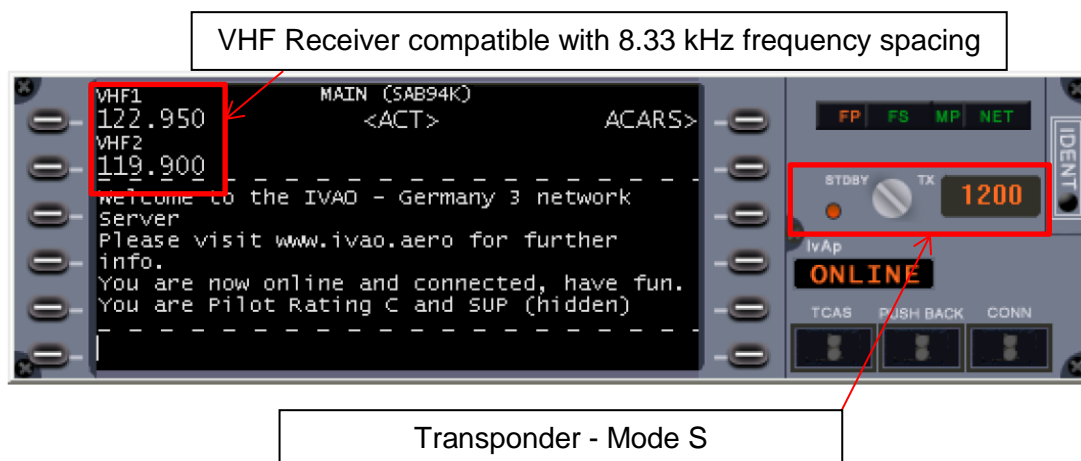
The table below regroups different transponder types commonly found in VFR-dedicated aircrafts.

Letter	Description
A	Transponder - Mode A (4 digits - 4096 codes)
C	Transponder - Mode A (4 digits - 4096 codes) and Mode C
N	It indicates that no surveillance equipment for the route to be flown is carried or the equipment is unserviceable.
P	Transponder Mode S, including pressure-altitude, but no aircraft identification capability.
S	Transponder Mode S, including both pressure-altitude and aircraft identification capability.
X	Transponder Mode S, with neither pressure-altitude nor aircraft identification capability.

Mode S: Whilst traditional Secondary Surveillance Radar (SSR) stations interrogate all aircraft within their range, Mode S (Select) establishes selective and addressed interrogations with aircraft within its coverage. Such selective interrogation improves the quality and integrity of the detection, identification and altitude reporting.

3. IvAp Software Default Equipments

By default, IVAO Pilot Interface (IvAp) provides equipments that may be included automatically in your flight plan, independently of your cockpit instruments.



IvAp provides:

- VHF receiver (2 channel) = letter **V** in the flight plan equipment section
- VHF receiver is compatible 8.33kHz frequency spacing = letter **Y** in the flight plan equipment section
- Mode S transponder = letter **S** in the flight plan transponder section (compatible with mode C)

Due to IvAp use, you shall at least include in your flight plan the following equipments: **VY/S** (or VY/C)

As IVAO simulates no-altitude-reporting transponders (acceptable only in non-controlled areas), you can modify your equipments to: **VY/A** (but it is not recommended to do so).

IvAp interface is not capable to simulate the following configuration using the letters: N, X, or P

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4. VFR-Flight Regulatory Equipments

4.1. Radio and Navigation

4.1.1. Radio requirement (V)

Any VFR flights operating in controlled airspaces must embark at least a VHF radio.

Radio is not mandatory on class E airspace but highly recommended.

Thanks to IvAp interface, you are always equipped with VHF radio and you must always include equipments **V** in your flight plan.

4.1.2. 8.33kHz Frequency Spacing (Y)

The 8.33kHz frequency spacing equipment is currently required above FL195 in some countries or in certain airspaces.

As the airspaces are crowded with aircraft, the need to switch some airspace using 8.33kHz frequency spacing is increasing; this equipment becomes more and more mandatory!

Thanks to IvAp interface, you are always equipped with 8.33 kHz VHF frequency spacing radio and you must always include equipments **Y** in your flight plan.

4.2. Transponder requirement (/C, /S)

Any VFR flights operating in controlled airspaces must embark now at least a type C transponder. Thanks to IvAp interface, you are always equipped with a type S transponder which is greater than any type C transponder, pilot shall fill the letter **S** in transponder section of the flight plan (letter **C** is acceptable in IVAO).

Aircraft with lower standards (transponder A) shall not plan their flight through controlled airspaces.

4.3. Performance Based Navigation (R)

Although VFR-flying aircrafts usually rely on visual aids and/or conventional mean of navigation such as VOR or NDB, some countries require basic RNAV capabilities at flight levels that may be used by VFR flights.

This basic RNAV capability is usually to embark a basic GPS onboard:

- Performance Based Navigation (PBN) is required = letter **R**
- Basic GPS embarked = letter **G**
- PBN equipment requires a complementary remark in field 18 of flight plan = for Basic GNSS (i.e. GPS) text to insert is **PBN/B2**.

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There is not a common flight level. Each country has defined its own limiting flight level. The following table will provide regulations for several countries in Europe:

Country	PBN is required above	Country	PBN is required above
Austria	FL95	Italy	FL95
Belgium	FL95	Netherlands	FL95
France	FL115	Spain	FL150
Germany	FL95	Switzerland	FL100
Ireland	FL95	UK	GND

In IVAO, if you do not know the PBN regulation applicable to VFR flights, you can consider that above FL95, the PBN is required.

5. Methodology

5.1. Principle

The simplest way to determine aircraft equipments is simply to list them by looking at the cockpit.

Transponder type cannot be determined visually unless you can identify a specific model. Nowadays, average general aviation airplanes are equipped with type C or S transponder.

For every flight on IVAO, you should consider that when using IvAp, as pilot, you will embark automatically portable 8.33kHz VHF radio (VY) and portable mode S transponder (/S).

5.3. Piper J-3 Cub

This version of Piper J-3 Cub is equipped with no navigational and no communication equipments.



Flight plan equipment list is letter **N**. No transponder letter is N.

The equipments to be inserted into flight plan item 10 are: **N/N**

flight plan for:	List of equipment to declare	Transponder to declare
Real flight	N	/N
IVA0 flight using IvAp	VY	/S

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5.4. Cessna 172

We will list together the equipment list of a Cessna 172.



Flight plan equipment list is letter F (ADF), G (GNSS), L (ILS), O(VOR), R(PBN), V(VHF), /C (Mode C transponder).

The equipments to be inserted into flight plan item 10 are: **SFGR/C**.

Remember not to insert **O, L & V** with the use of letter **S**.

flight plan for:	List of equipment to declare	Transponder to declare
Real flight	SFGR	/C
IVAO flight using IvAp	SFGRY	/S
IVAO flight using IvAp with no use of PBN	SFGY	/S

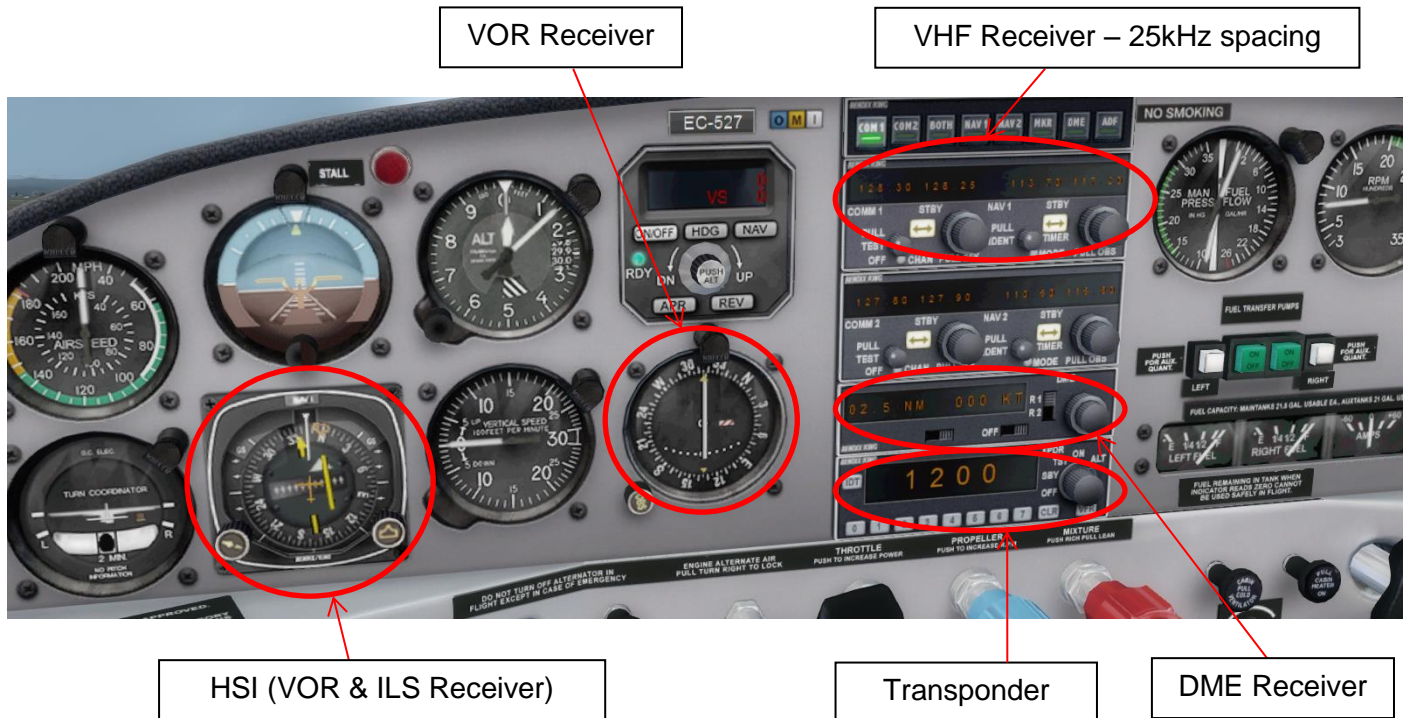
This aircraft is not equipped with a DME receiver.

PBN/B2 text shall be inserted in the remarks for the use of letter R and the GPS equipment.

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5.5. Maule Orion

We will list together the equipment list of a Maule Orion.



Flight plan equipment list is letter D (DME), L (ILS), O(VOR), V(VHF), /C (Mode C transponder).

The equipments to be inserted into flight plan item 10 are: **SD/C**.

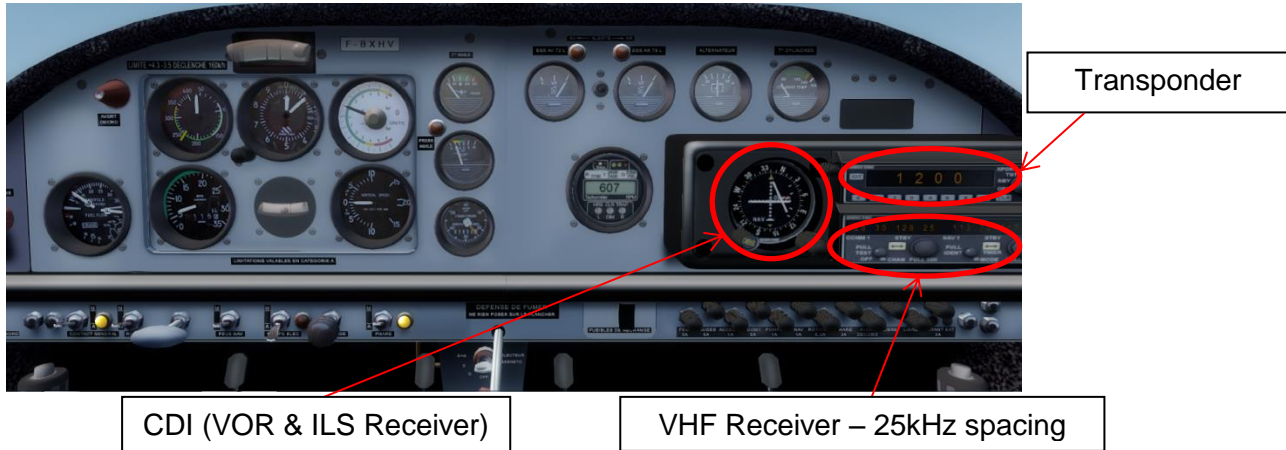
flight plan equipment list	List of equipment to declare	Transponder to declare
Real flight	SD	/C
IVAO flight using IvAp	SDY	/S

This aircraft has neither GNSS receiver (GPS), nor NDB receiver (ADF). Remember not to insert **O, L & V** with the use of letter **S**.

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5.6. Cap 10B

Cap 10B is an aircraft dedicated for aerobatics and contain very little equipment



Flight plan equipment list is letter L (ILS), O(VOR), V(VHF), /C (Mode C transponder).
The equipments to be inserted into flight plan item 10 are: **S/C**.

flight plan for:	List of equipment to declare	Transponder to declare
Real flight	S	/C
IVAO flight using IvAp	SY	/S

Remember not to insert **O**, **L** & **V** with the use of letter **S**.

5.7. DR400

We will list together the equipment list of a Robin DR400.



Flight plan equipment list is letter G(GNSS receiver), O(VOR), R(PBN), V(VHF), /C (Mode C transponder).
The equipments to be inserted into flight plan item 10 are: **GORV/C**.

flight plan for:	List of equipment to declare	Transponder to declare
Real flight	GORV	/C
IVAO flight using IvAp	GORVY	/S
IVAO flight using IvAp with no use of PBN	GOVY	/S

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5.8. Beechcraft 58 Baron

Beech Baron 58 is a versatile aircraft, made for private operations, travel and leisure. It has a default instrumentation made for both VFR and IFR, focusing toward modernity and future.

Garmin 500 - includes: VHF receiver (8.33 kHz spacing), GNSS receiver



VOR Receiver

DME receiver

HSI (VOR & ILS Receiver)

Transponder

Flight plan equipment list is letter D (DME), G (GNSS), L (ILS), O(VOR), R(PBN), V(VHF), /S (Mode S transponder).

The equipments to be inserted into flight plan item 10 are: **SDGR/S**

flight plan for:	List of equipment to declare	Transponder to declare
Real flight	SDGR	/S
IVAO flight using IvAp	SDGRY	/S
IVAO flight using IvAp with no use of PBN	SDGY	/S

This aircraft is not equipped with a DME receiver.

PBN/B2 text shall be inserted in the remarks for the use of letter R and the GPS equipment.

6. Conclusion

VFR flights do not require many regulatory types of equipment.

Usually, these aircrafts are fit with a few equipments and it is easy to determine them rapidly.

It only then took a few minutes to file a flightplan with correct equipments.

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