



Elon, ~~Twitter~~ X, and the PIA: How **not** to achieve privacy in aviation

Dr. Martin Strohmeier

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About the Speaker: Two Hats

- Day job: Senior Scientist at **Cyber-Defence Campus of armasuisse Science + Technology**
 - Security and privacy research in critical infrastructures, in particular aviation
- Night job: Co-Founder and board member of the **OpenSky Network**
 - Non-profit, crowdsourced air traffic network collecting data for aviation research since 2013





Aircraft are Globally Trackable by Anyone

flightradar24
LIVE AIR TRAFFIC

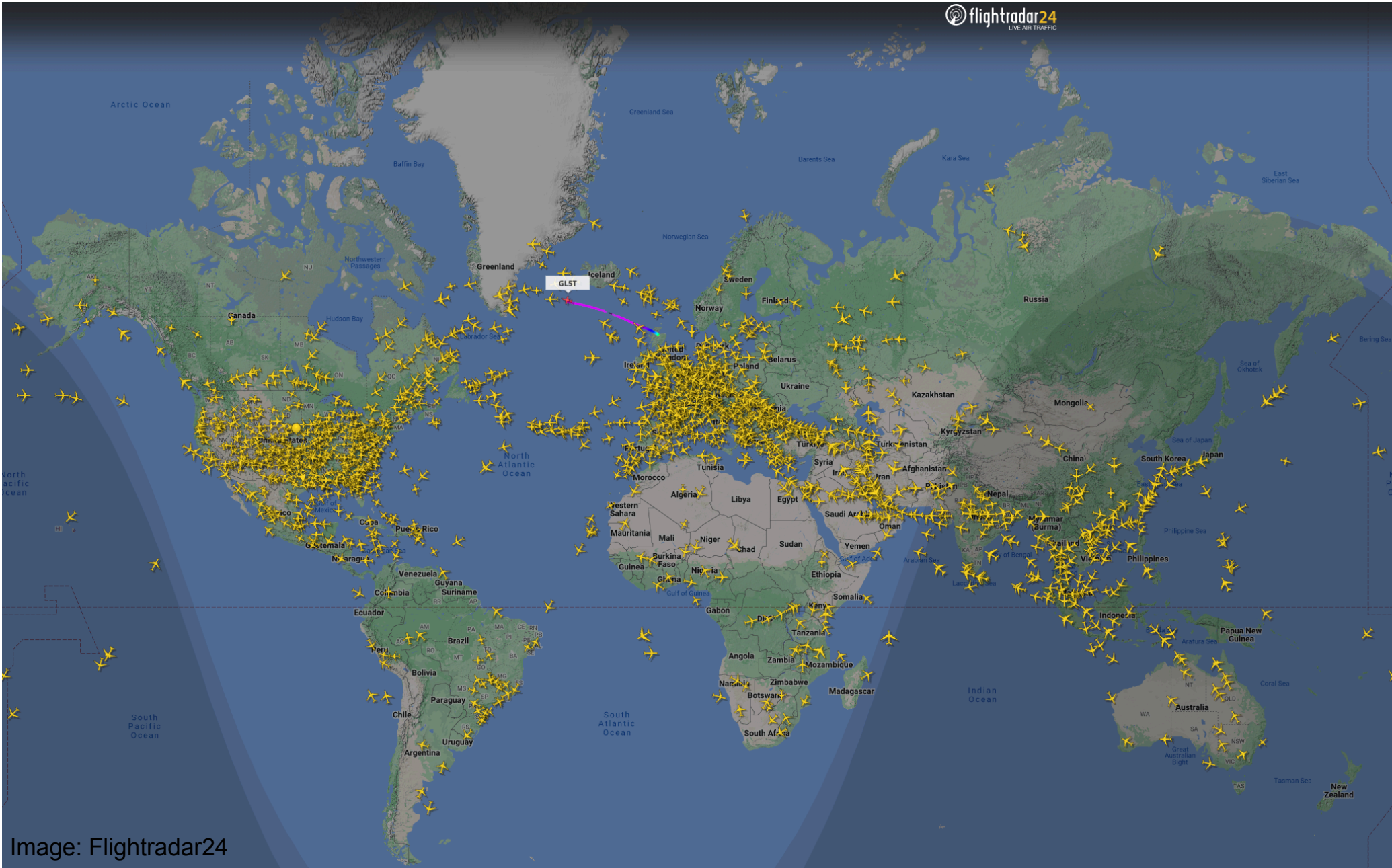


Image: Flightradar24

Elon, Twitter and the PIA: How **not** to achieve privacy in aviation – DEFCON Aerospace Village 2023
VBS / armasuisse / S+T/ Dr. Martin Strohmeier

Real Consequences



“Relying in part on **information provided by GVA Dictator Alert**, Geneva public prosecutors opened a **formal investigation on Equatorial Guinea Vice President Teodoro Nguema Obiang Mangue**, aka Teodorin Obiang, for suspected money laundering of corruption proceeds. On November 31, 2016, the Geneva prosecutors seized 11 luxury cars owned by Teodorin Obiang at Geneva airport.”

■ July 2, 2019, 11:00 AM GMT+2

Hedge Funds Are Tracking Private Jets to Find the Next Megadeal

● Where there's a plane, there's a data trail.

By Justin Bachman



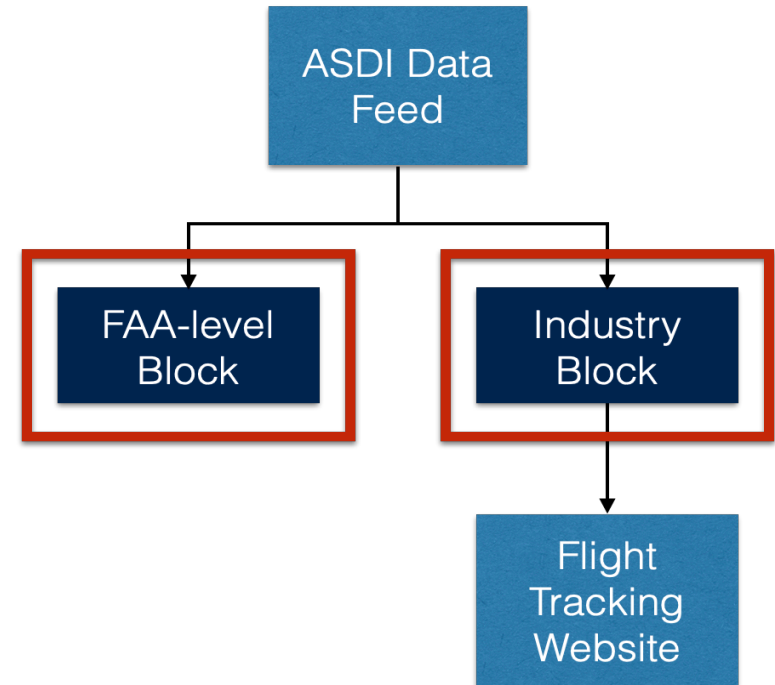


History of (US) Technical Solutions to Aircraft Tracking



Attempt 1: The BARR Program (2000)

- Blocked Aircraft Registration Request
- Implemented by US Congress in **2000!!** [1]
- List with safety-concerned individuals maintained by the NBAA
- Ask web trackers (“industry”) to please not display an aircraft on the list
 - US-only program
 - Applicable only if a website/industry uses FAA feed
 - NOT applicable to crowdsourced ADS-B data
 - No legal requirement, obscurity at best



[1] Olga Gurtovaya. “Maintaining Privacy in a World of Technological Transparency: The BARR Program’s ups and downs in Changing Times”. In: *Journal of Air Law and Commerce* 77 (2012), pp. 569–603

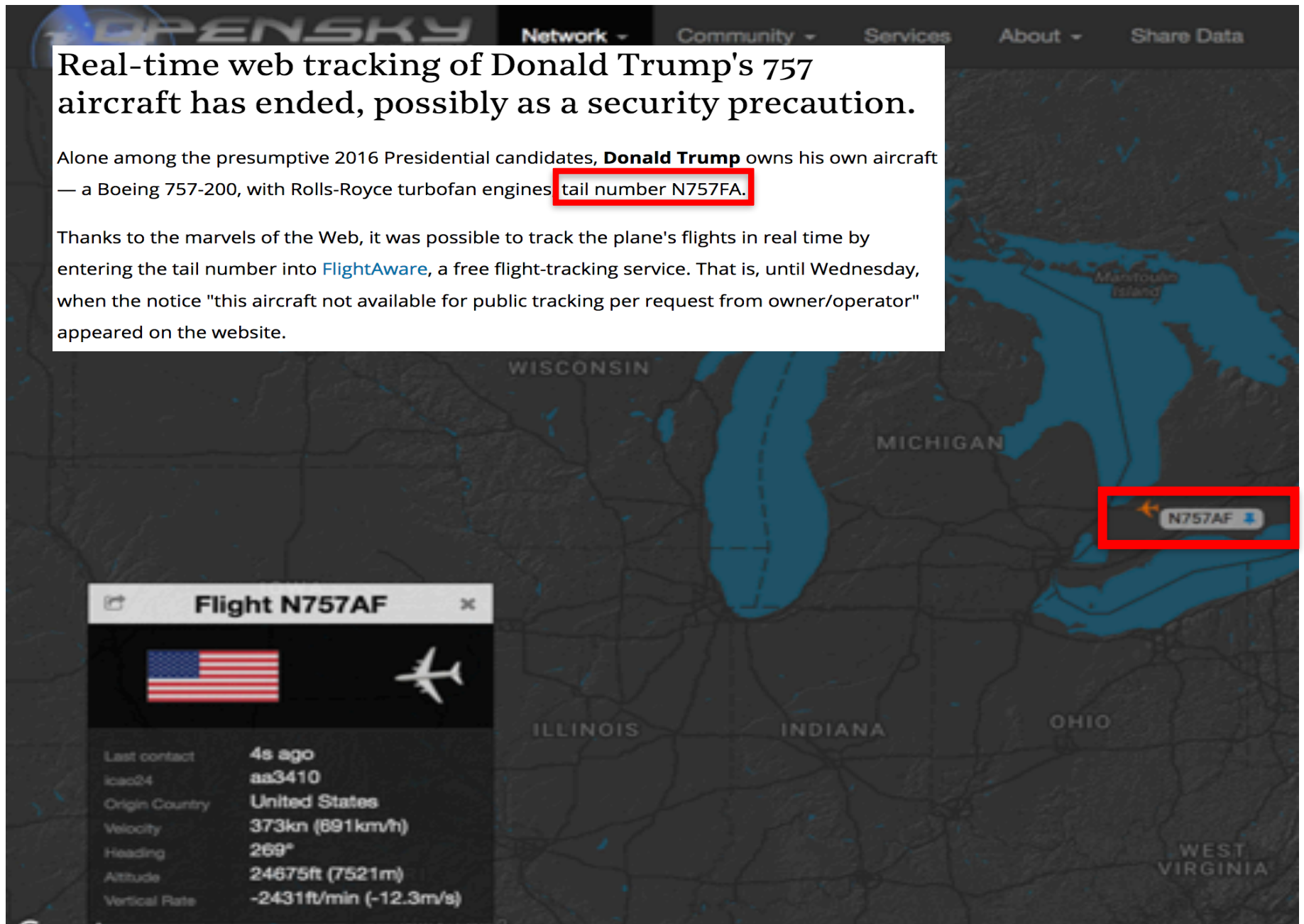


Security by Obscurity Never Works

Real-time web tracking of Donald Trump's 757 aircraft has ended, possibly as a security precaution.

Alone among the presumptive 2016 Presidential candidates, **Donald Trump** owns his own aircraft — a Boeing 757-200, with Rolls-Royce turbofan engines **tail number N757FA.**

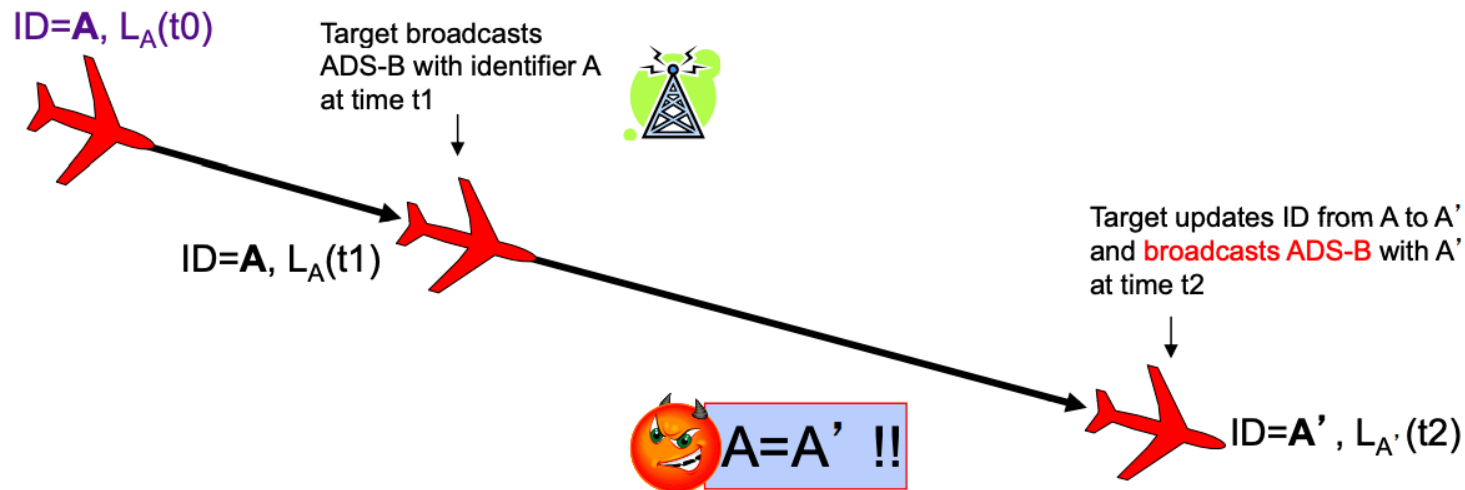
Thanks to the marvels of the Web, it was possible to track the plane's flights in real time by entering the tail number into [FlightAware](#), a free flight-tracking service. That is, until Wednesday, when the notice "this aircraft not available for public tracking per request from owner/operator" appeared on the website.





Attempt 2: Random Transponder ID (2010)

- First implementation of random temporary identifiers, part of standard DO-282B
- Limited to a few ADS-B UAT-using GA under VFR
- Random ID can be correlated with real ID (Sampigethaya, 2013).



- Most importantly, FAA recommends against it, as the operator **will not be eligible to receive ATC services** and may **not be able to benefit from enhanced ADS-B search and rescue capabilities**”



Attempt 3: The LADD Program (2018)

- BARR by another name: Limiting Aircraft Data Displayed
- Now the FAA maintains the list directly
<https://www.faa.gov/pilots/ladd>
- Implements the requirements set forth in 2018 HR 254 FAA Reauthorization Bill: Section 566, Right to Privacy When Using Air Traffic Control System.

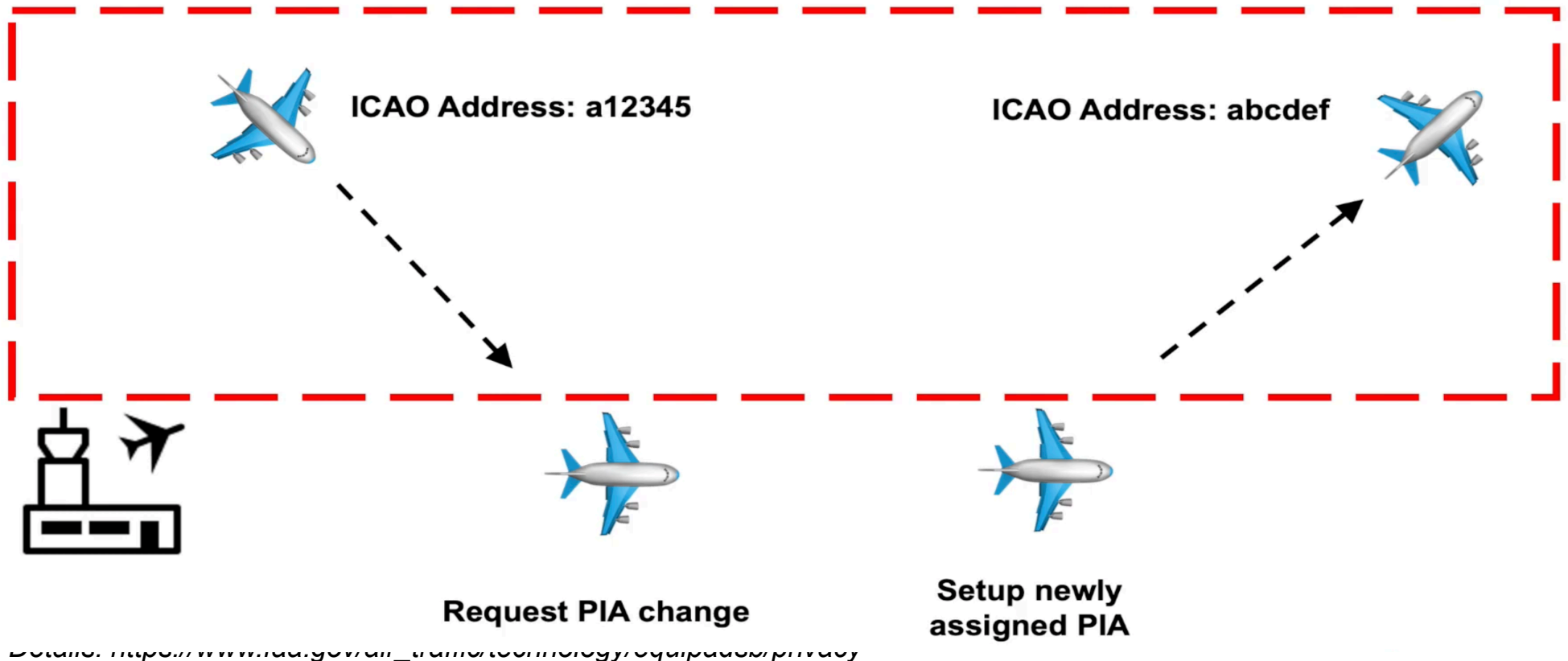
“ The Administrator shall, upon request of a private aircraft owner or operator, block the registration number of the aircraft from any public dissemination or display, except in data made available to a Government agency, for the noncommercial flights of the owner or operator. ”

- No real technical change



Attempt 4: The PIA Program (2020)

- **Second attempt at random temporary transponder identifiers**
- Now for standard ADS-B 1090ES in US airspace, maintained by FAA





Attempt 4: The PIA Program (2020)

- This, of course, is a mix net!

ars TECHNICA

BIZ & IT

TECH

SCIENCE

POLICY

CARS

GAMING & CULTURE

STORE

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BETTER OFF STUDYING —

Use of Tor helped FBI ID suspect in bomb hoax case

Tor can be an effective tool for covering your tracks, but not always.

DAN GOODIN - 12/18/2013, 8:15 PM

88

It's true that the [Tor anonymity service](#) helps people cover their tracks on the Internet. But when it's not used carefully, it can be the very thing that tips off the people the user wants to evade, as was demonstrated in a federal investigation earlier this week.

According to federal prosecutors, Tor played a key role in helping FBI agents identify a [Harvard student suspected of e-mailing a hoax bomb threat](#) to university officials so he wouldn't have to take a final exam. To conceal his Harvard IP address, he used Tor, but in a fatal mistake, he also used the school's Wi-Fi network to connect to the anonymity service. Investigators, according to a [criminal complaint](#), [took a hard look at everyone who used Tor at the time the threats were sent and ultimately fingered 20-year-old Eldo Kim of Cambridge, Massachusetts as the perpetrator.](#)

["This is one of the problems of using a rare security tool," security analyst Bruce Schneier observed in a \[blog post published Wednesday.\]\(#\) "The very thing that gives you plausible deniability also makes you the most likely suspect. The FBI didn't have to break Tor; they just used conventional police mechanisms to get Kim to confess."](#)



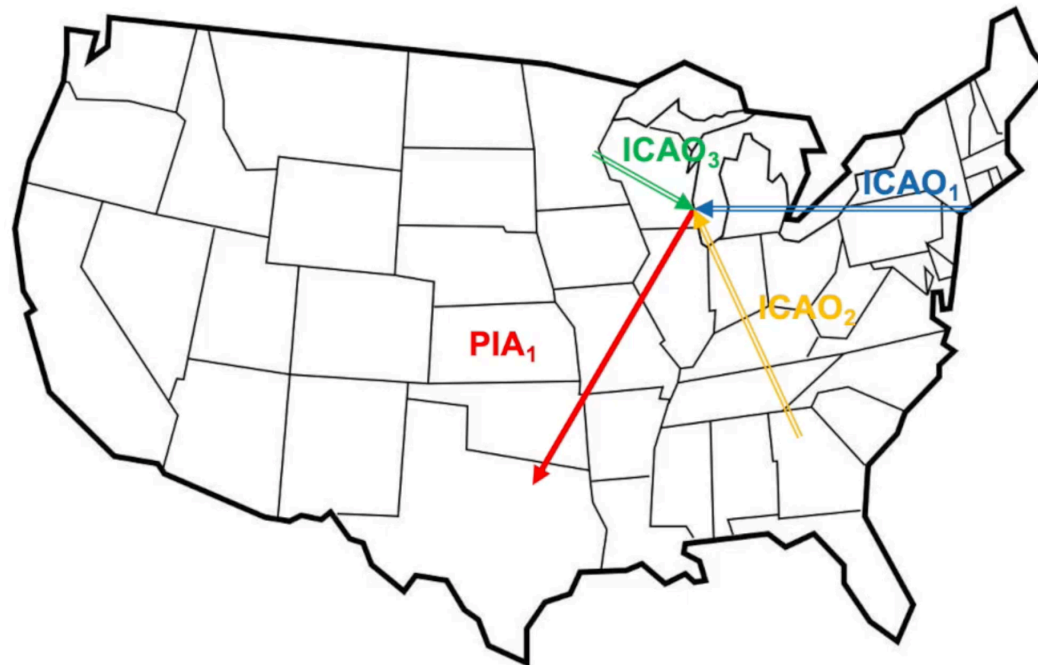
Attempt 4: The PIA Program (2020)

- Pointed out at the Aerospace Village 2020

Attack methodology



2. Associate a PIA with a FAA registration





PIA: It's a Honey-pot!

ADB5447
Hex: 50801C Copy Link
adsbexchange.com

Reg.: UR-82008
Ukraine
DB flags: LADD
Type: A124
ANTONOV An-124 Ruslan
Type Desc.: L4J
Squawk: 3465

History
SPATIAL

Groundspeed: 323 kt
Baro. Altitude: 32000 ft
WGS84 altitude: 30425 ft
Vert. Rate: 64 ft/min
Track: 275.7°
Pos.: 46.212°, -80.359°
Distance: 2817.1 nmi

SIGNAL

Source: ADS-B
RSSI: -8.5
Msg. Rate: 7.4
Receivers: 4
Last Pos.: 0.0 s
Last Seen: 0.0 s

FMS SEL

Sel. Alt.: 32000 ft
Sel. Head.: n/a

WIND

Speed: 108 kt
Direction (from): 280°
TAT / OAT: -31 / -56 °C

SPEED

U H T

Improve Coverage: adsbexchange.com
Premium Login: no ads / Sat. Layer
FAQ Map Help

Total Aircraft: 7218
On Screen: 41

Search Filters Columns

Filter by altitude:
ft to ft Filter Reset

Filter by callsign: Filter Reset

Filter by squawk: Filter Reset

Filter by type code: Filter Reset

Filter by type description: Filter Reset

Filter by ICAO hex id: Filter Reset

Filter by source:
ADS-B UAT / ADS-R
MLAT TIS-B
Mode-S Other
ADS-C

Filter by DB flags:
Military PIA
LADD

Filter by registration: Filter Reset

Filter by country of registration: Filter Reset

Filter by category (A3,B0,...): Filter Reset

Hex ID	Callsign	Type	Alt. (ft)	Spd. (kt)	Dist. (nmi)	Wind D.	Wind
A8908B	N851BA	GLF6	41000	585	2435.9		
AAF3AF	N8044T	P28A	4150	104	2707.2		
A5714C	N45RT	F2TH	ground	22	2737.7		
50801C	ADB5447	A124	32000	323	2817.1	280°	1
AD1CA5	TWY94	GLEX	9725	233	2840.1		

Source: ADS-B Exchange



Then Came 2022: A Story in Several Acts



ELON MUSK

A 19-year-old built a flight-tracking Twitter bot. Elon Musk tried to pay him to stop.

'I've put a lot of work into it, and \$5k is just really not enough.'



Elon Musk considers the Twitter account a security risk. | Photoillustration: Brendan Smialowski/AFP and Getty Images Plus; Protocol



Proving PIA's Utility in Practice



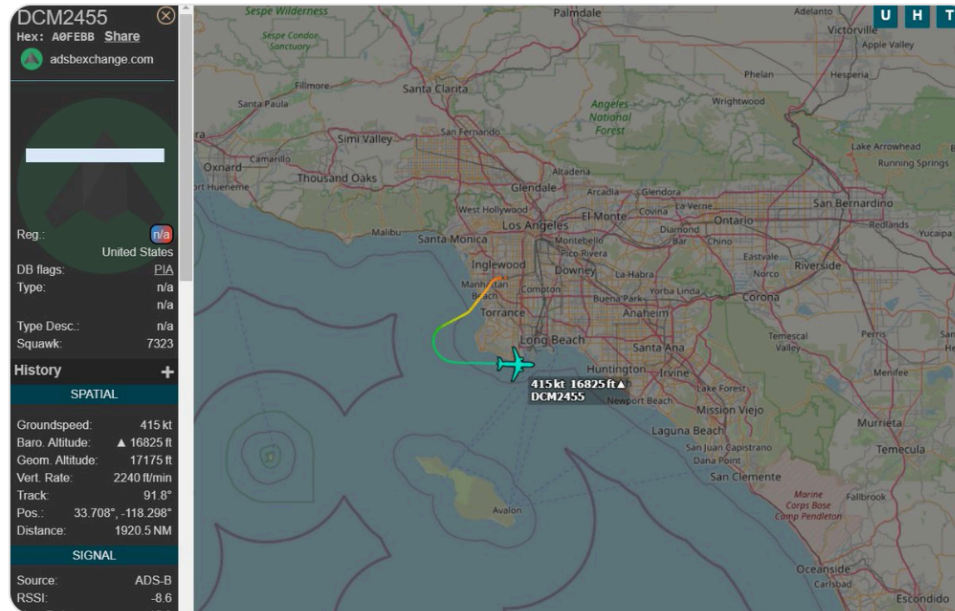
Jack Sweeney

@JxckSweeney

Follow



Elon got PIA but I've already identified it!



12:37 PM - 26 Jan 2022

79 Retweets 1,334 Likes



255 79 1.3K



Jack Sweeney @JxckSweeney · Jan 30

Confirmed on PIA, but I'm all good here still.

60 8 381



Act 2: More bots, climate



mai 2022

récap du mois

18 vols
~ 46 heures
~ 176 t CO2

Estimations pour le jet privé F-GVMA



Ce compte suit les trajets du jet privé de LVMH, dont le patron est Bernard Arnault, 3e fortune du monde

Notre objectif : rendre visible le mode de vie polluant des plus riches

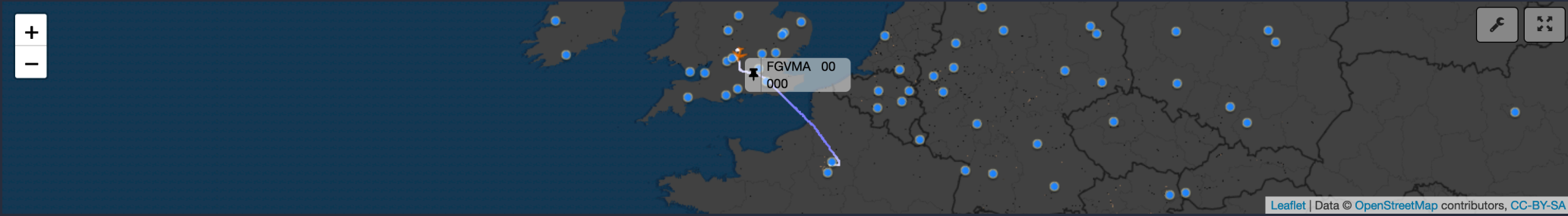




Act 3: Astroturfing Aircraft Data

✈ Flights for 0x395580

2022-11-08 22:33:51



First Seen	Last Seen	Duration	Callsign	Est. Origin Airport	Est. Destination Airport
08:27 UTC	09:05 UTC	38 m	FGVMA	Paris-Le Bourget Airport (LFPB)	London Biggin Hill Airport (EGKB)

Successful merge

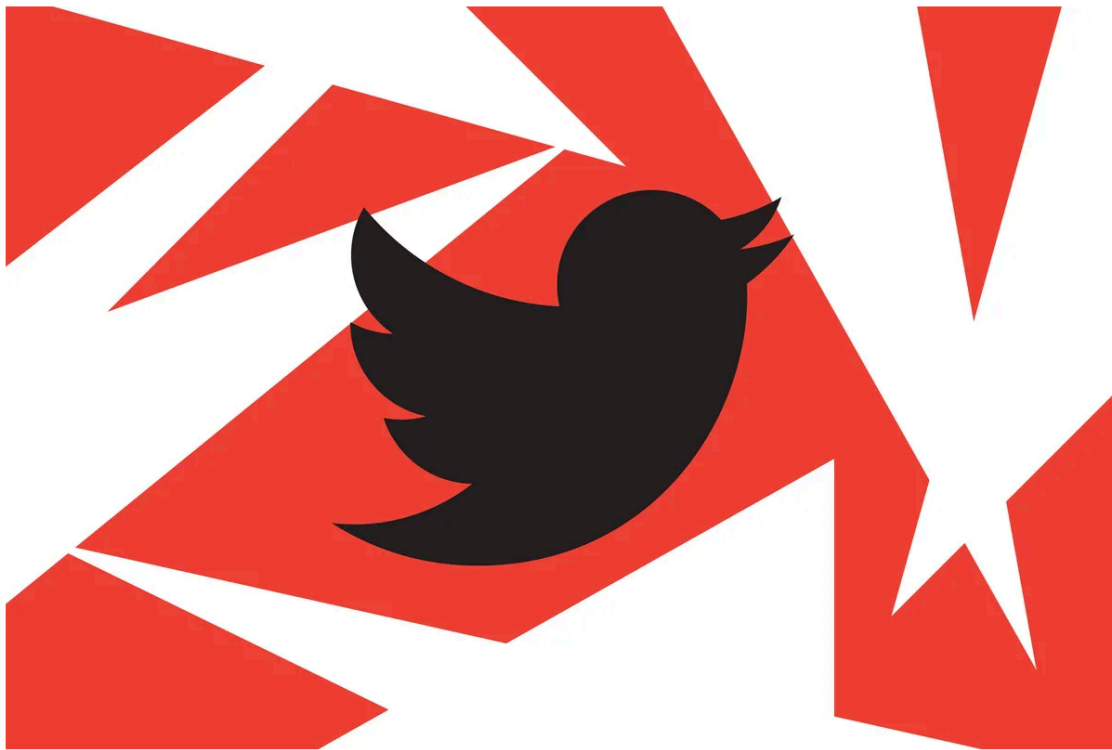
icao24	395580	395580	395580
registration	F-HJJI	F-HJJI	F-HJJI
timestamp	1970-01-01 01:00:00.0	2022-06-19 06:07:40.0	2022-06-19 06:07:40.0
source	null	user-data	user-data
manufacturericao		AIRBUS	AIRBUS
manufacturername		AIRBUS	AIRBUS
model		A321 NEO	A321 NEO
typecode		A321	A321
serialnumber		255578	255578
operator		Air France	Air France
operatorcallsign		AIRFRANS	AIRFRANS
operatoricao		AFR	AFR
operatoriata		AF	AF



Act 4: Elon, Again and Again

TWITTER / TECH / ELON MUSK

Twitter banned the @ElonJet account tracking Musk's flights, reinstated it, then banned it again



/ The company has also posted a thread explaining where the line is when it comes to tweeting live location data, like you would if you were tracking Elon Musk's plane.

By [JAY PETERS](#)

Updated Dec 15, 2022, 1:46 AM GMT+1 | [124 Comments](#) / [124 New](#)



Twitter doesn't seem to like the jet-tracker's creator. Illustration by Alex Castro / The Verge



Act 5: (Supra-)national Activity



John Wiseman
@lemonodor

Saudi Arabia is concerned enough with non-governmental ADS-B tracking of aircraft that they submitted a paper to the ICAO with proposals on how to stop it. As far as I know, plane tracking has not resulted in any safety issues, or even anything close. [ops.group/dashboard/wp-c...](#)

ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST SECURITY AND PRIVACY CONCERNS AND POSSIBLE SOLUTIONS

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

Automatic dependent surveillance — broadcast (ADS-B) data is commonly used by internet-based flight tracking platforms to provide commercial real-time tracking including private and security sensitive flights. This paper provides information on the current practices for sharing ADS-B data through the Internet using specialized flight tracker platforms and websites. The uncontrolled access to detailed/accurate ADS-B data on the internet raised concerns by aircraft operators and owners on safety, security, and privacy of flights. The paper proposes potential solutions that may be considered to mitigate safety and security risks suggesting a controlled level of privacy measures. It also highlights the potential financial implications that ICAO may consider in the development of new standards and technical specifications to protect the ADS-B data from public use and restrict the access to air traffic management (ATM) community.

12:18 am · 10 Nov 2022




Act 5: (Supra-)national Activity

The Intercept

BECOME A MEMBER

PENTAGON JOINS ELON MUSK'S WAR AGAINST PLANE TRACKING

The U.S. military's elite special operations command doesn't want its planes tracked, according to a procurement document.

 Sam Biddle
July 18 2023, 10:49 a.m.

A TECHNOLOGY WISH LIST circulated by the U.S. military's elite Joint Special Operations Command suggests the country's most secretive war-fighting component shares an anxiety with the world's richest man: Too many people can see where they're flying their planes.

The Joint Special Operations Air Component, responsible for ferrying commandos and their gear around the world, is seeking help keeping these flights out of the public eye through a "Big Data' Analysis & Feedback Tool," according to a procurement document obtained by The Intercept. The document is one of a series of periodic releases of lists of technologies that special operations units would like to see created by the private sector.

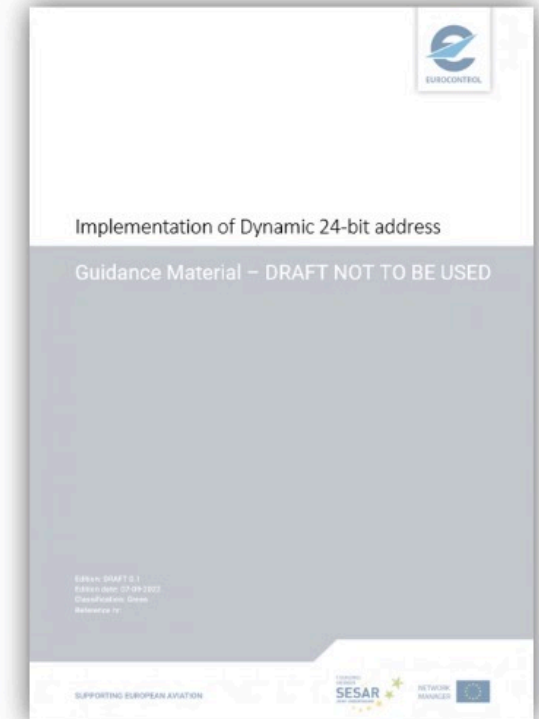


Act 5: Europe doesn't learn from the US



DRAFT Implementation of dynamic-24 bit address

- DRAFT GM - includes two dynamic 24-bit address methods:
 - Single address
 - Privacy ICAO Address (PIA), assigning two addresses per aircraft
- Processes for:
 - Aircraft operators
 - Organisations allocating 24-bit addresses
- Considerations for:
 - ANSPs
 - Route charging
 - Others..
- Current constraints for PIA in ICAO Annex 10
 - Proposals to amend the requirements have not been accepted (yet)
 - Engagement/Support by states needed to resolve the situation



Note: Other approaches are possible (e.g. central / delegated assignment)



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EUROPE · PRIVATE JETS

LVMH boss Bernard Arnault sold his private jet so people on Twitter won't track him anymore

BY PHIL SERAFINO AND BLOOMBERG

October 17, 2022 at 1:03 PM GMT+2



Bernard Arnault, billionaire and chairman of LVMH Moët Hennessy Louis Vuitton SE, at the inauguration of the Atelier Louis Vuitton Vendôme in Vendôme, France, on Feb. 22, 2022.

NATHAN LAINE—BLOOMBERG VIA GETTY IMAGES

The [world's second-richest man](#) has had enough of the Twitterverse tracking his every move in his private plane.

Bernard Arnault's luxury-goods company LVMH sold its private jet, he said Monday on Radio Classique. Accounts such as I Fly Bernard and Bernard's Airplane had sprung up on [Twitter](#) to track the planes of French billionaires and to point out the pollution they cause. The subject became a hot topic in France over the summer, with some politicians proposing to ban or tax private jets.

Most Popular

POLITICS

Congress just heard 3 retired Air Force members testify about UFOs and 'non-human biologics' and America is totally...



July 26, 2023

BY CHLOE BERGER

SUCCESS

Workers are creating a 'dead zone' between 4–6 p.m. to fit in COVID-era habits like school runs and gym sessions



July 25, 2023

BY ORIANNA ROSA ROYLE



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