

# The great aviation patent spike of 1910

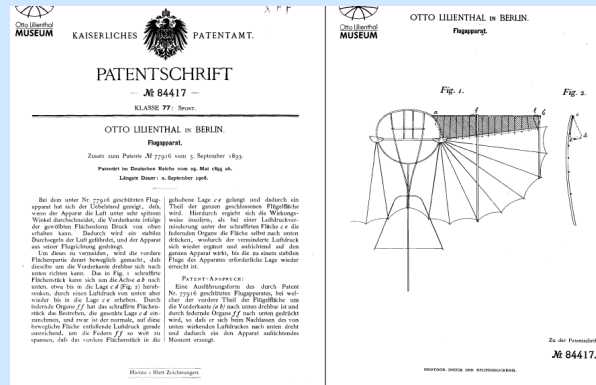
Peter B. Meyer

U.S. Bureau of Labor Statistics

Views and findings in this work represent only the author

Albatrosses Aerospace History Seminar

January 28, 2021



# Outline

- Context – aeronautical history and economics
- Patents
- The wiki for patent data
- Findings in progress

# Overview of historical context

- 1880s: Ballooning clubs, journals, and exhibitions
  - Interest in “aerial navigation” and “flying machines” gathers there
  - Aeronautics is a hobby – maybe hopeless, useless, dangerous
- 1890s: Public glider flights ; Chanute’s survey book
  - Many designs were shared — “open source” practices
- 1903 Wright brothers’ powered-glider flight, 1906 major patent
- 1908-11 Big exhibitions.
  - A wave of new manufacturers start up or branch into aviation
  - Huge increase in aero patents, then a decline
- 1914 World War I begins

# Economic context

- Problem-solvers can work on aeronautics and cooperate and exchange information through patents and other publications. (Scientists, tinkerers)
- A competitive industry can accumulate patents as intellectual property – designs and technologies, mainly for sale in a market
- In between, it's not like an equilibrium
  - There are radical inventions
  - A wave of new companies appear, making a startup industry.
  - Chaotic ; many different perspectives are in play
- What does the patent stream look like through this period?

# A patent of Otto Lilienthal



Otto Lilienthal  
MUSEUM

KAISERLICHES



PATENTAMT.

## PATENTSCHRIFT

— № 84417 —

KLASSE 77: SPORT.

OTTO LILIENTHAL IN BERLIN.

Flugapparat.

Zusatz zum Patente № 77916 vom 3. September 1893.

Patentiert im Deutschen Reiche vom 29. Mai 1895 ab.

Längste Dauer: 2. September 1908.

Bei dem unter Nr. 77916 geschützten Flugapparat hat sich der Uebelstand gezeigt, daß, wenn der Apparat die Luft unter sehr spitzem Winkel durchschneidet, die Vorderkante infolge der gewölbten Flächenform Druck von oben erhalten kann. Dadurch wird ein stabiles Durchsegeln der Luft gefährdet, und der Apparat aus seiner Flugrichtung gedrängt.

Um dieses zu vermeiden, wird die vordere Flächenpartie derart beweglich gemacht, daß dieselbe um die Vorderkante drehbar sich nach unten richten kann. Das in Fig. 1 schraffierte Flächenstück kann sich um die Achse *ab* nach unten, etwa bis in die Lage *cd* (Fig. 2) herabsenken, durch einen Luftdruck von unten aber wieder bis in die Lage *ce* erheben. Durch federnde Organe *ff* hat das schraffierte Flächenstück das Bestreben, die gesenkte Lage *cd* einzunehmen, und zwar ist der normale, auf diese bewegliche Fläche entfallende Luftdruck gerade ausreichend, um die Federn *ff* so weit zu spannen, daß das vordere Flächenstück in die

gehobene Lage *ce* gelangt und dadurch ein Theil der ganzen geschlossenen Flügelfläche wird. Hierdurch ergibt sich die Wirkungsweise insofern, als bei einer Luftdruckverminderung unter der schraffirten Fläche *ce* die federnden Organe die Fläche selbst nach unten drücken, wodurch der verminderte Luftdruck sich wieder ergänzt und aufrichtend auf den ganzen Apparat wirkt, bis die zu einem stabilen Fluge des Apparates erforderliche Lage wieder erreicht ist.

### PATENT-ANSPRUCH:

Eine Ausführungsform des durch Patent Nr. 77916 geschützten Flugapparates, bei welcher der vordere Theil der Flügelfläche um die Vorderkante (*ab*) nach unten drehbar ist und durch federnde Organe *ff* nach unten gedrückt wird, so daß er sich beim Nachlassen des von unten wirkenden Luftdruckes nach unten dreht und dadurch ein den Apparat aufrichtendes Moment erzeugt.

Hierzu 1 Blatt Zeichnungen.



Otto Lilienthal  
MUSEUM

OTTO LILIENTHAL IN BERLIN.

Flugapparat.

Fig. 1.

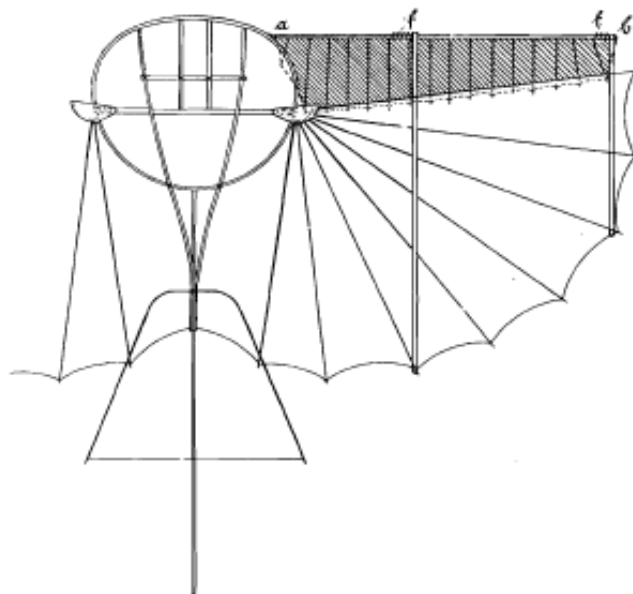


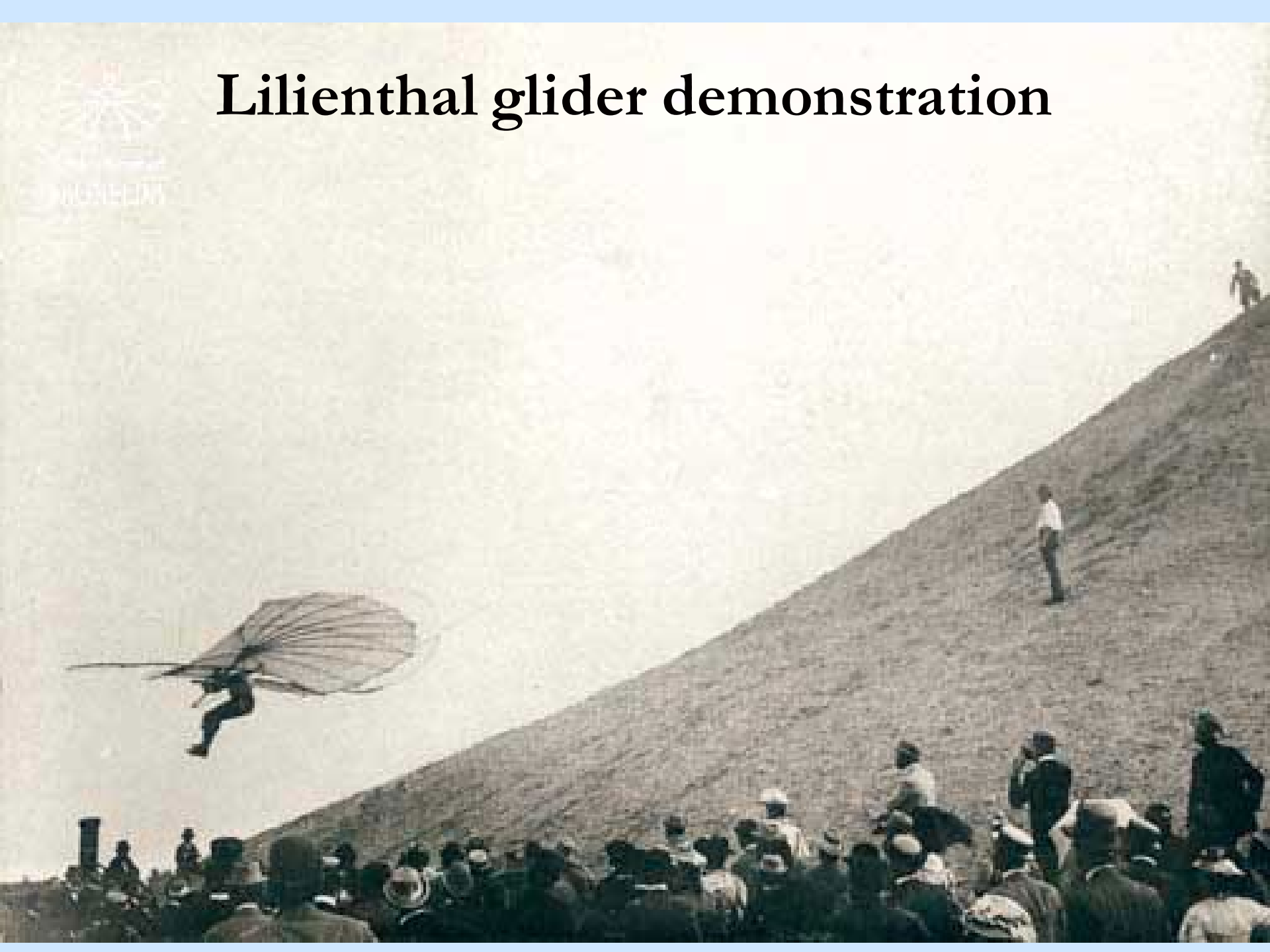
Fig. 2.



Zu der Patentschrift

№ 84417.

# Lilienthal glider demonstration



# Aero patent data

Our data comes from many sources

- Mainly European Patent Office via World Intellectual Property Organization
- EPO's Web site [espacenet.com](http://espacenet.com)
- Web sites of national patent offices (France, Germany, Hungary, Australia, NZ)
- Gazettes and journals of patent offices ; Aeronautics journals
- Archives and libraries of US PTO, Belgium
- Many more sources listed in paper; more needing to be used and listed

Patent counts are highest in France, U.S., Britain, Germany

There was a trend toward lower fees to file a patent.

Patents were growing exponentially in all countries, except Netherlands had no patents

Patent documents seem similar across countries in content. Biggest difference:

- France and Britain “register” an application then courts decide
- Germany and U.S. did more thorough examinations of patent applications.
- So the level differs across countries. Changes and trends are similar.

# Aero patent data challenges

- A patent's data relevance to aeronautics/aviation not always clear
- We are accumulating information on patent classifications of the time and now
- Very limited data on some, e.g. title, inventor last name (see below)
- Patent “additions” inheriting a priority date (filing date)
- A patent can be a “foreign filing” of another: same content in another country
  - For now we count additions and foreign filings like other patents
- Some patent applications are complete when filed, others completed later
- Country definitions: Austria-Hungary, colonies
- Patent office practices – hard to find
- Terminology

**LISTE DES BREVETS**  
RELATIFS À L'AÉRONAUTIQUE ET AUX SCIENCES QUI S'Y RATTACHENT  
DÉPOSÉS EN FRANCE DU 10 JUIN 1901 AU 19 SEPTEMBRE 1901 (1)

312,642.	— 20 août 1901.	— de Dion : Perfectionnements aux ballons dirigeables.
312,665.	— 21 août 1901.	— de Dion : Perfectionnements à la construction des ballons dirigeables et à leurs mécanismes de propulsion.
312,673.	— 21 août 1901.	— Sibillot : Perfectionnements dans la navigation aérienne.
312,676.	— 21 août 1901.	— Buguet : Aérostat dirigeable.
312,682.	— 21 août 1901.	— Dussain : Nouveau système de ballons dirigeable.
312,689.	— 22 août 1901.	— Hébert : Planophile le « Georges Hébert », nouvel appareil d'aviation.
312,738.	— 25 août 1901.	— Lemoine : Perfectionnements aux aéroplanes.
312,786.	— 26 août 1901.	— Delaurier : La navigation aérienne pyrotechnique.
312,957.	— 2 septembre 1901.	— Tarr : Nouveau système de ballons.
312,962.	— 3 septembre 1901.	— Piquier : Perfectionnements dans l'aérostation.
312,985.	— 4 septembre 1901.	— Porak : Machine à voler.
314,895.	— 7 septembre 1901.	— Violand : Système de ballon dirigeable.
314,146.	— 10 septembre 1901.	— Riedinger : Hélice aérostatique à poids formant volant.
314,207.	— 12 septembre 1901.	— Magnie : Nouveau ballon dirigeable.
314,219.	— 13 septembre 1901.	— Guillaume : Perfectionnements apportés aux dispositifs employés dans la navigation aérienne.
314,368.	— 19 septembre 1901.	— Patti del Pozzo : Aérostat dirigeable.

(1) Communication de MM. Maillier et Habeler, Office International pour l'Établissement de brevets d'invention en France et à l'étranger, 42, boulevard Beaue-Nouvelle, Paris.

Paris, — IMPRIMERIE CHARENTAISE, 7, rue de la Harpe. — Le Directeur général : GEORGES BRÉAULT.

APPAREILS DE SAUVETAGE, PISCICULTURE ET GRANDE PÊCHE, AÉROSTATS.

— 210762. — 13 janvier 1891, STRETCH, rep. par Chassevent, boul. Magenta, 11, Paris. — Perfectionnements dans les hameçons.

— 210861. — 19 janvier 1891, REYNAL, éisant domicile chez le sieur Foveau de Courmelles, rue du Printemps, 7, Paris. — Propulseur aquatique et aérien nommé : *Propulseur des fluides*.

*Certificats d'addition.*

— 191876. — 14 janvier 1891, VIVIER, rep. par Good, rue de Rivoli, 70, Paris. — Cert. d'add. au brevet pris, le 18 juillet 1888, pour un système de projection d'huile à distance sur la mer pour calmer les brisants.

— 195306. — 14 janvier 1891,



# Patent data on a wiki

- Each patent gets a page
- Wiki page can be edited from browser
- Paragraphs discuss the patent or data about it, including ambiguities
- Footnotes, hyperlinks, and categories as on Wikipedia
- Can include Wikipedia images or upload
- The table at bottom is structured data — one row in a table of patents

## Patent US-1889-398984

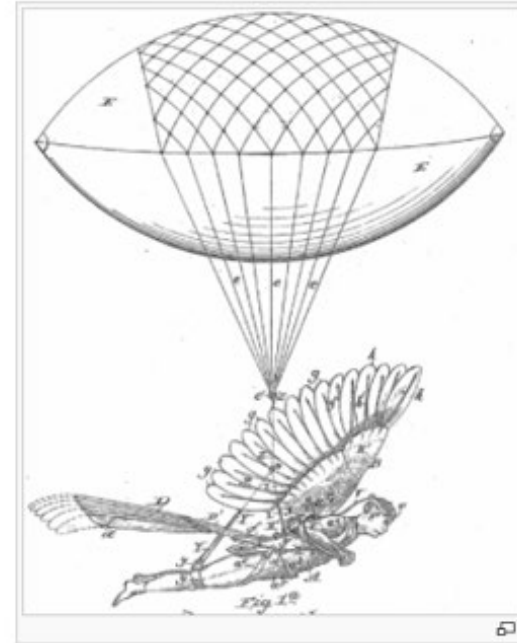
Human flapping attached wings underneath a gas balloon

Lilienthal museum's Seifert notes:

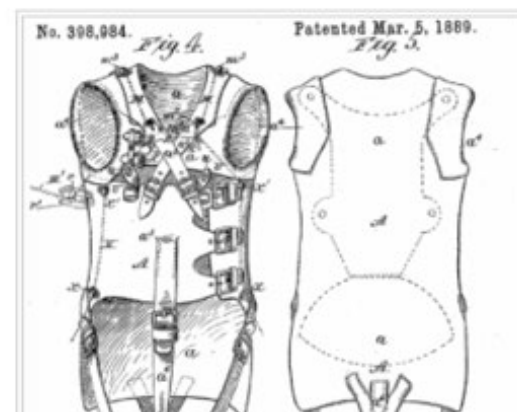
- Spalding built a model in the shape of a flying human. The flying apparatus consists of wings and a tail, which are connected to the plane with a jacket-like construction. Straps in the pelvic area pass between the legs on the back. The wings attached to the wrist are pivotable by Holm joints. They are attached to the 13 springs along the direction of flight. The wings are to be flapped by the movement of the arms. The tail was spreadable. The model is to be made airworthy by a balloon. It is located in the Washington DC **National Air and Space Museum**. Spalding patented this model. Bildquelle: Quelle 1, S. 63 gl 68 S. 77
- Seifert cites V. Moolman. *The way to Kitty Hawk*. Amsterdam 1981, p. 63, and translates the original title as "Flügel Schlagmodell"
- Inventor location: Rosita, CO

### Sources [\[edit\]](#)

- [Original patent document](#) [and USPTO classification metadata](#) [at US PTO site](#)
- [Patent 398984 document](#) [and bibliographic info](#) [on espacenet](#)
- [Patent 398984](#) [at google patents](#)
- [Archive record of this patent](#) [at the Lilienthal museum patents web site](#)
- [Short's DB](#)
- [Other sources of information about this patent are on the Web](#)



Year filed	1888
Year granted	1889
Office	<a href="#">US</a>
Patent number	398984
Inventors	<a href="#">Reuben Jasper Spalding</a>
Inventor country	<a href="#">US</a>
Applicant person	
Applicant firm	
Applicant type	
Applicant is inventor?	Yes
Original title	Flying-machine



# Patent-related data on a wiki

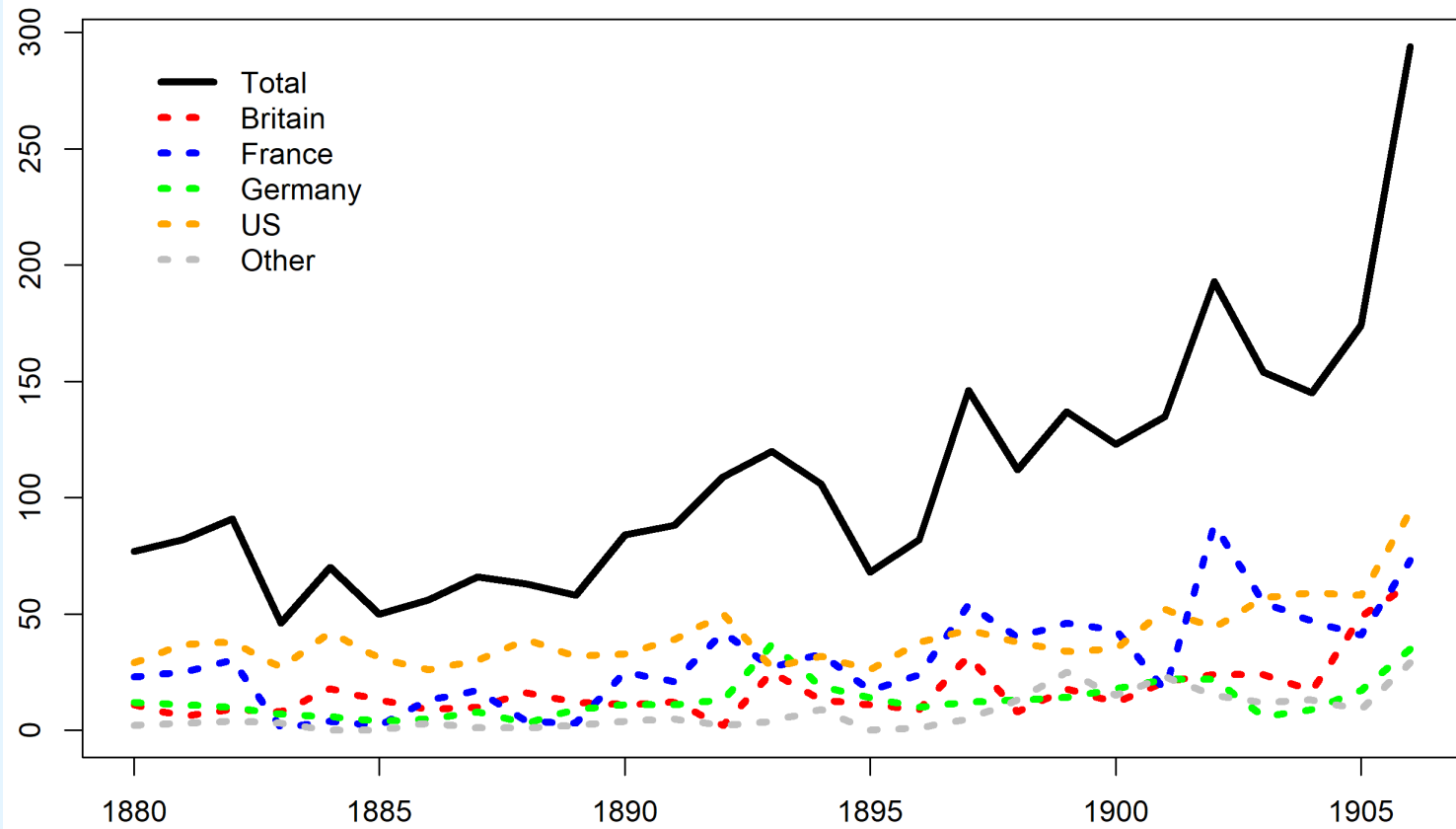
- Each publication, letter, club, firm, etc., can have a page too
  - We have more than 15,000 patents and more than 22,000 bibliographic entries
  - A page on an inventor or company can automatically list their publications and patents.
  - This helps identify and disambiguate individuals
  - There are many error or incompatibilities in our source data we can note and correct
  - Ambiguities (e.g., who is C. S. Forbes) and alternate names and spellings can be linked together without making changes to the source record
  - Each page has a history that can be inspected, audited, cited
- ➔ The wiki is good for combining mini-histories into statistics and larger histories

Feel free to search and use it at <http://econterms.net/aero>

Or ask me. We'd welcome more data too. The wiki will cite you or your work.

We may broaden participation some point

## Aeronautical and aviation patents by year filed, 1880-1906



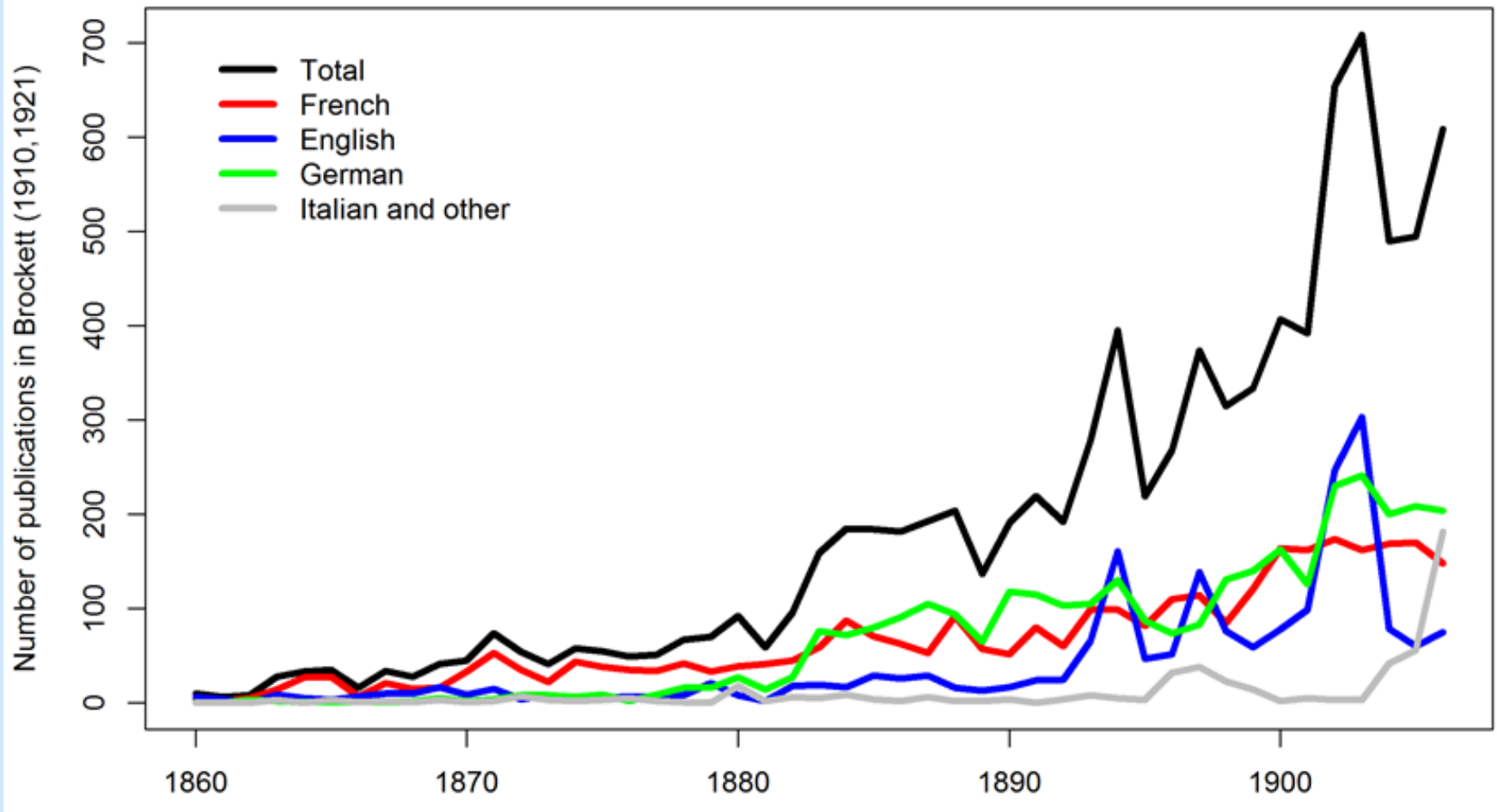
Aero patents grew steadily then spike

Year = year patent was filed, if available; otherwise year granted minus 1

Grows 5% to 7% per year, roughly like patents overall

In 1906: Wrights get patent; Public flight by Santos-Dumont

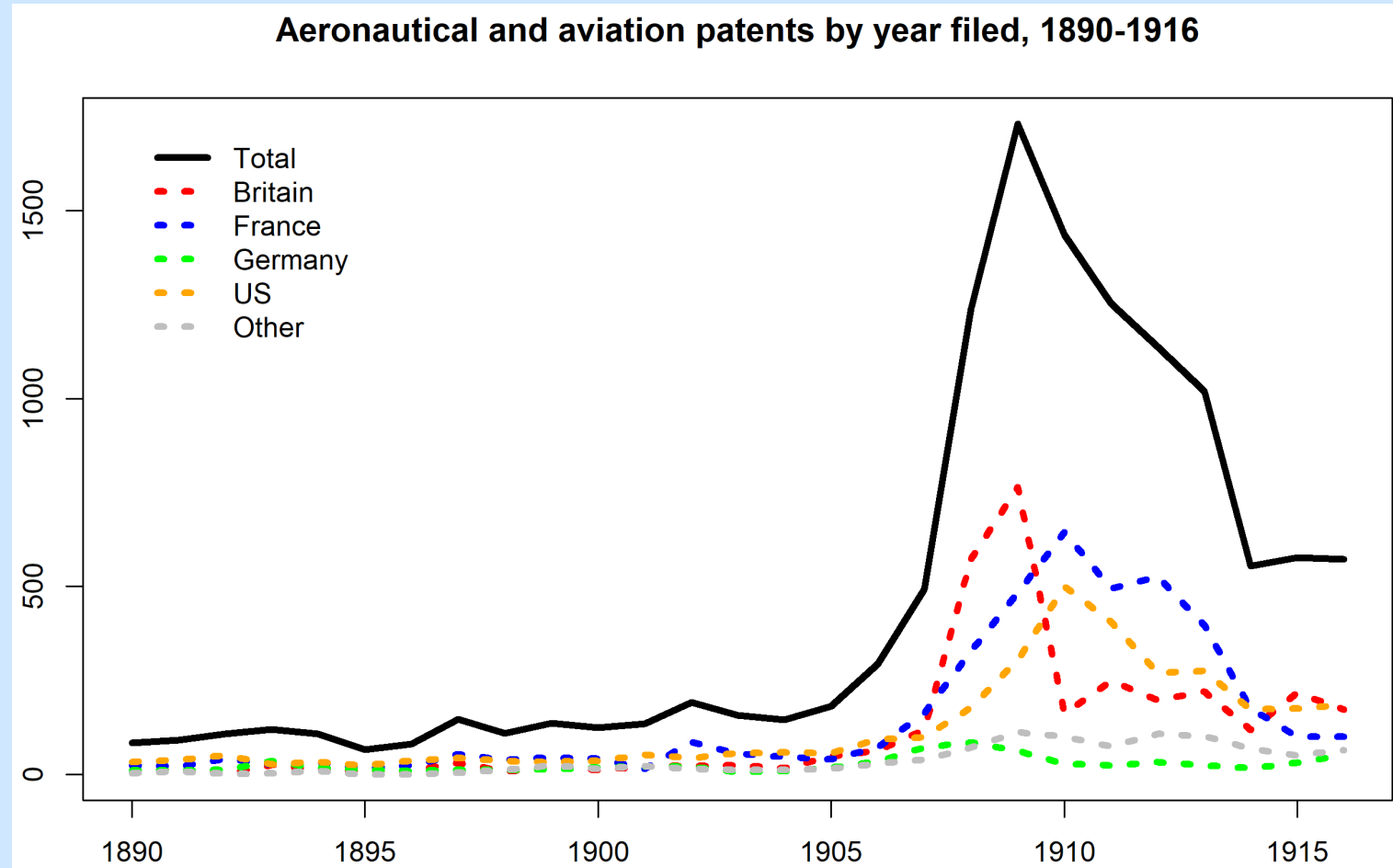
At some point we will be able to chart exact filing dates within 1906



## Aeronautics publications, 1860-1906

- These are mostly short articles in journals. Source: Brockett bibliography (1910)
- Same exponential growth, across languages. More numerous than patents

# Spike in aero-related patents 1906-1911



From coded sample of all the patents, using filing-year or (grant year minus 1)  
No apparent distinct effect of Wright lawsuits in U.S. 1910-1911  
In World War I, aviation technology is dangerous to share; less is published

# Comparing patents as text

When possible we count pages of text and numbers of diagrams and claims

For a sample we compare page counts across France, Germany, Britain, US

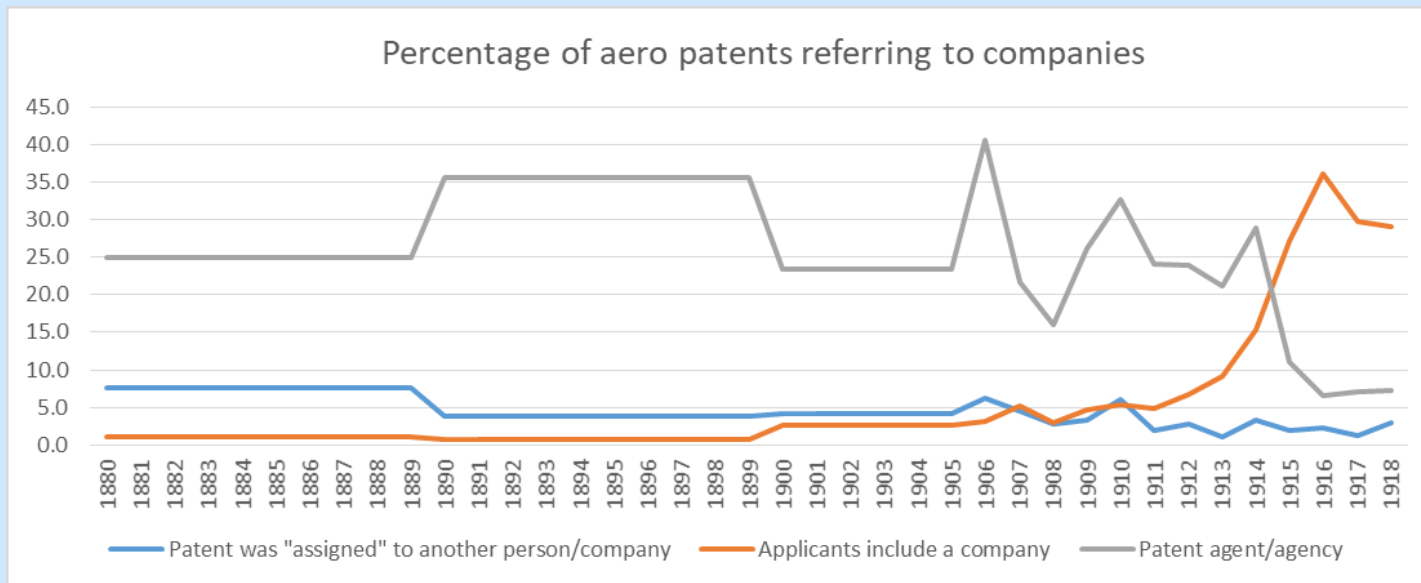
- Germany's were shortest, with fewer text pages and diagrams
- British patents were longer with more text
- U.S.'s make the most legal claims
- These patterns may be the same for non-aero patents

Aero patents have slightly more text in 1909-11 and afterward

We see a modest increase in foreign filings in the spike period

# Relations of patentees to firms

- 1) A **patent agent** may have filed the patent. Procedures and documentation vary by country.
  - 2) An **applicant** for a patent may be a firm or org, perhaps along with the inventor.
  - 3) A firm or person might be “**assigned**” (buy) the patent rights at the time of the grant.
- \*\* For all these, procedures and documentation vary by country, and the sample’s incomplete.



Early data for 1880-89, 1890-99, and 1900-1905 are smoothed by averaging.

Findings: These variables don't change much around 1910. "Assignment" wasn't common.

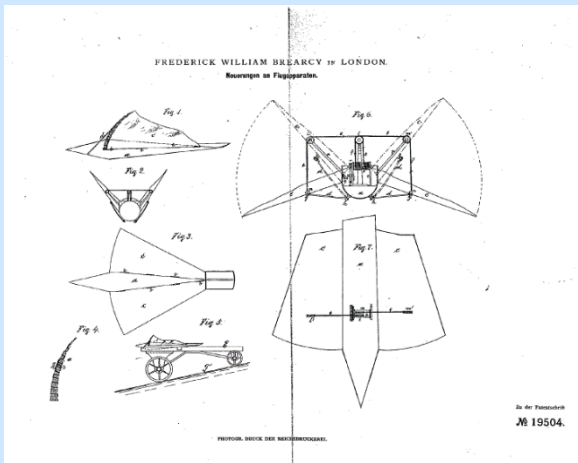
There's an increase in company applicants starting in 1912, and sharply in World War I.

There's a sharp decline in use of patent agents here, possibly because companies are applying. (?)

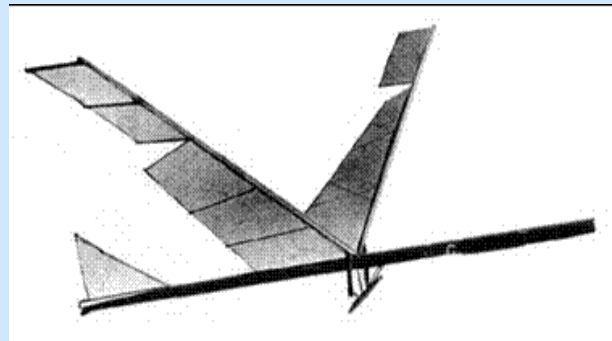
# Technological themes of early aero (1): Flapping wings

They want to make a bird.

**Ornithopters:** machines with flapping wings



Brearey's 1882 patent



Hargrave 1891 model  
ornithopter

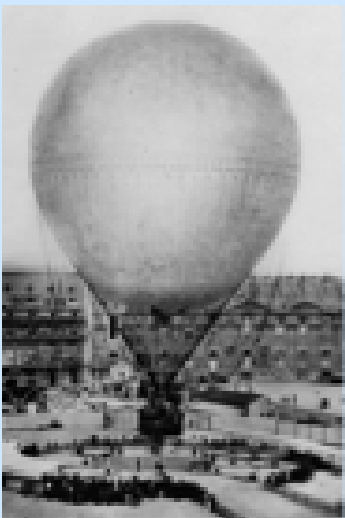


Frost 1902 ornithopter



# Technological themes of early aero (2)

## From balloon to steerable dirigible



Giffard 1878

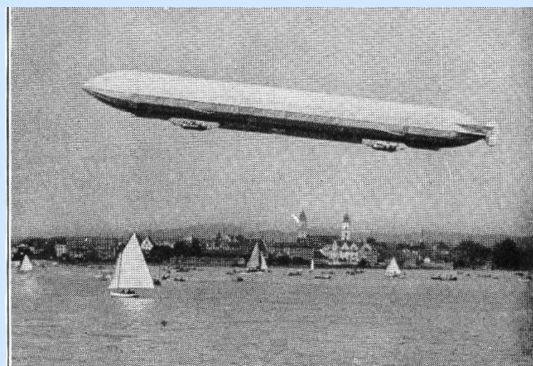


Balloon contest 1895

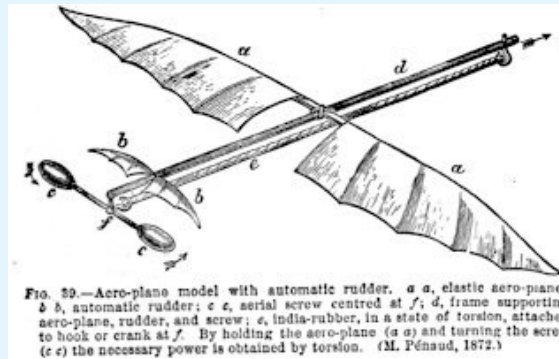


Santos-Dumont 1901 dirigible  
flew around Eiffel Tower and  
returned to starting place

Zeppelin,  
~1910

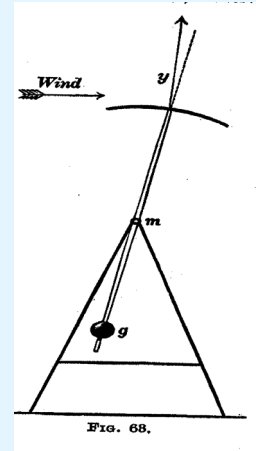


# Technological themes of early aero (3): Soaring: Fixed wings, kites, gliders

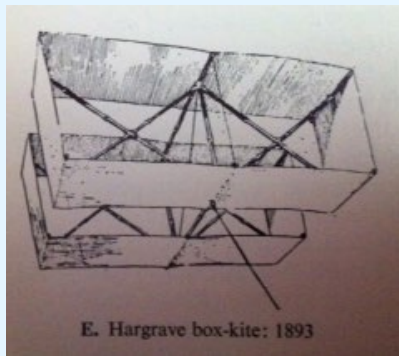


Penaud, ~1872

Wind-up model with tail



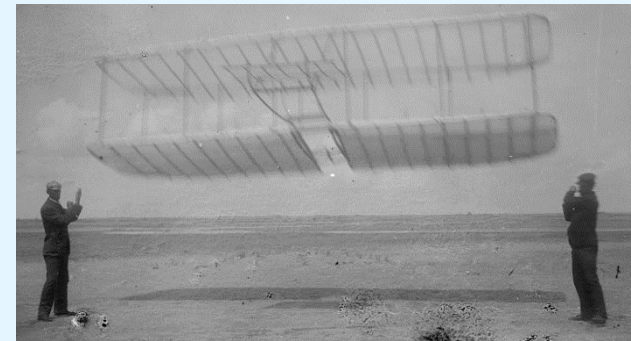
Lilienthal airfoil tests  
1870s-1880s



Hargrave box kites 1893

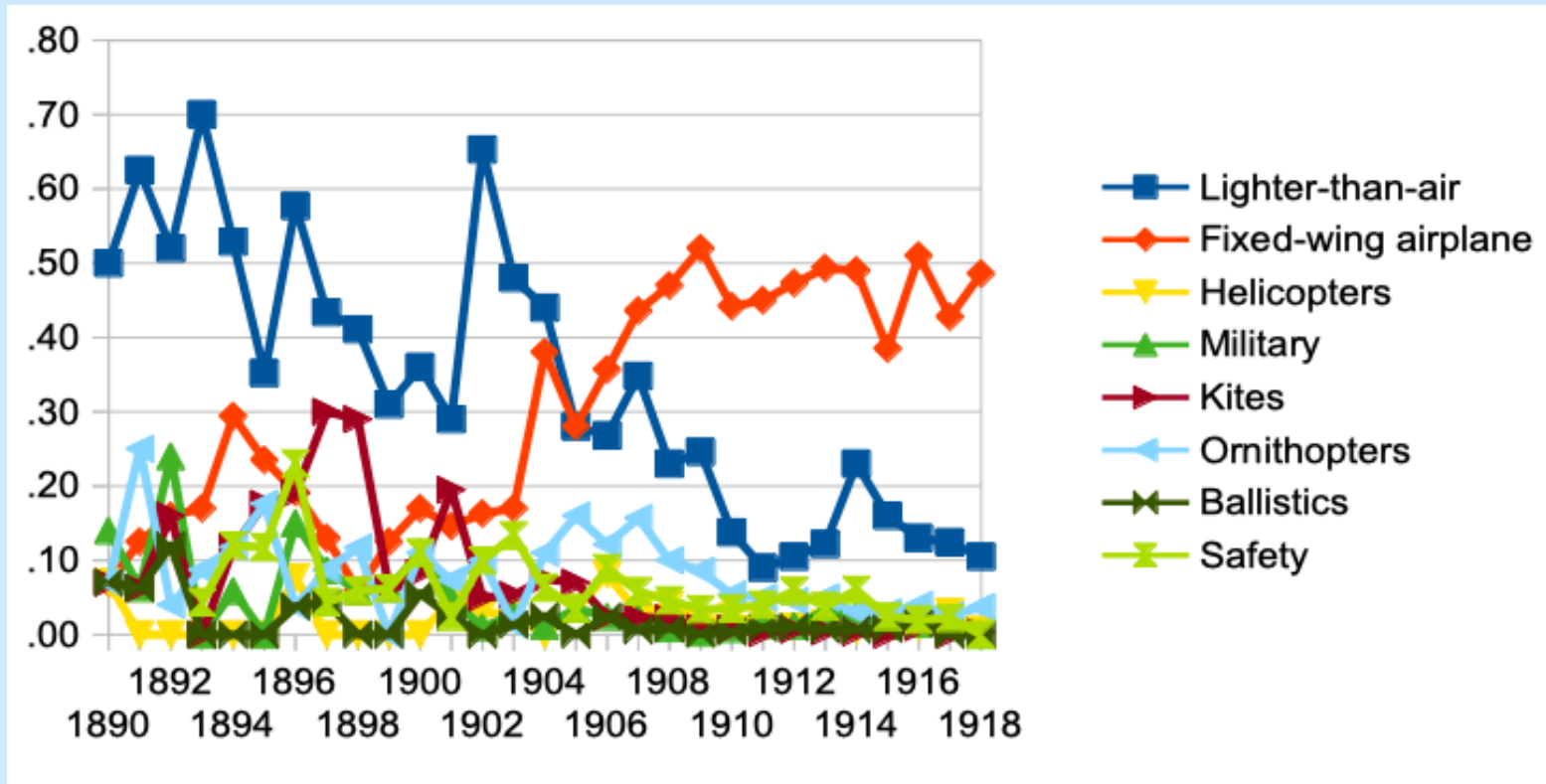


Chanute-Herring glider, 1896



Wrights, 1901-2

# Proportions of patents by topic



- **Fixed-wing airplane designs rise to half about 1909 then stabilize**
- Relative decline after 1903 in balloons, dirigibles, and ornithopters
- The 1906-1910 jump raises numbers in all these categories – aviation is **hot**
- Notes: A patent can be classed in several or none of these
- Patents categorized by official sources or our interpretation

# Possible narratives for 1909-11 patent boom

- Experienced patentees (tinkerers) could have founded startups. (not much)
- Companies accumulated patent rights in the new industry (not much)
- New patentees responding to opportunity appear in this field (yes)
- Previous & new aero patentees put more effort into inventing or filing
- There are more supplementary patents (foreign filings, additions) (yes)
- There are more duplicative or trivial patents (probably)
- More conflict over patent rights (yes re Wrights)

# Conclusions: how patents changed

Aero-related patents boom from 1906 to 1909 then decline after 1911

Tech: The spike/wave is associated with the success of airplane design

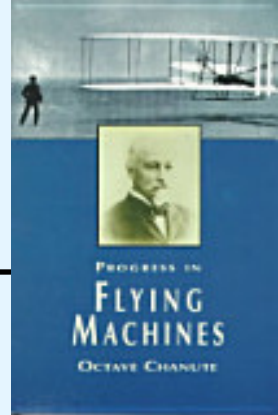
Airplane designs outgrow balloon and ornithopter designs

Industry: Airplane manufacture has begun.

We can measure some increases in aero patenting in the spike:

- Patentees make more foreign filings (a kind of investment)
- Many new filers for aero patents (to be estimated)
- Companies did not seem to acquire many patents.
- Wrights' lawsuits do not seem to affect the U.S. numbers particularly
- Later in WWI, industry consolidates, invests; more company patents

# Goal: Track activity by individuals or institutions *before* the big invention



Experimenter	Location (home)	Page counts Chanute (1894)	Publication counts Brockett (1910)	Aero patent counts
Maxim	Britain (US)	33	25+	11
Lilienthal	Germany	31	50+	15
Pénaud	France	22	12	2
Mouillard	Algeria, Egypt (Fr)	21	6	1
Hargrave	Australia (Br)	19	25+	0
Moy	Britain	19	10	9
Le Bris	France	17	0	1
Langley	U.S.	16	40+	0
Wenham	Britain	15	10+	1
Phillips	Britain	14	3	4
Chanute	U.S. (France)	*	50+	5

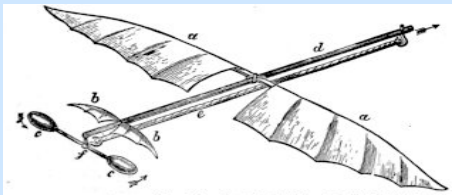


# Design evolution by imitation

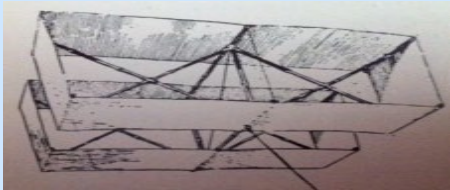
## Known from letters, publications, and patents



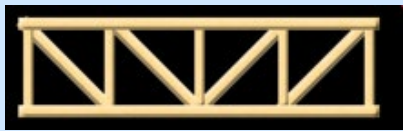
Lilienthal's glider



Penaud's tail



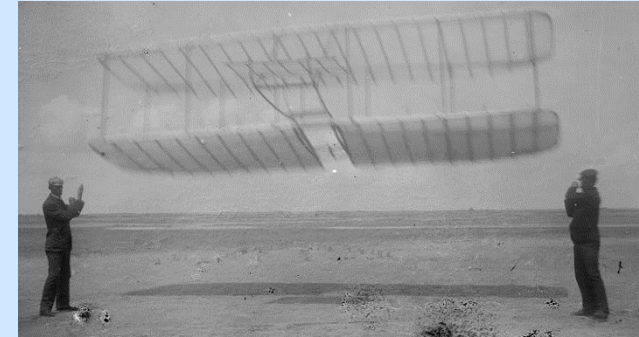
Hargrave's box kites



Pratt truss for bridges



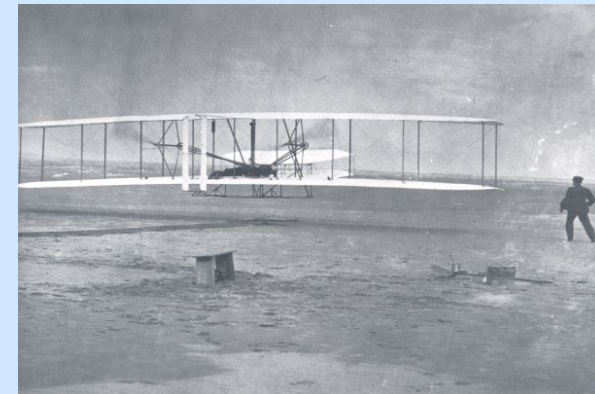
Chanute-Herring  
glider, 1896



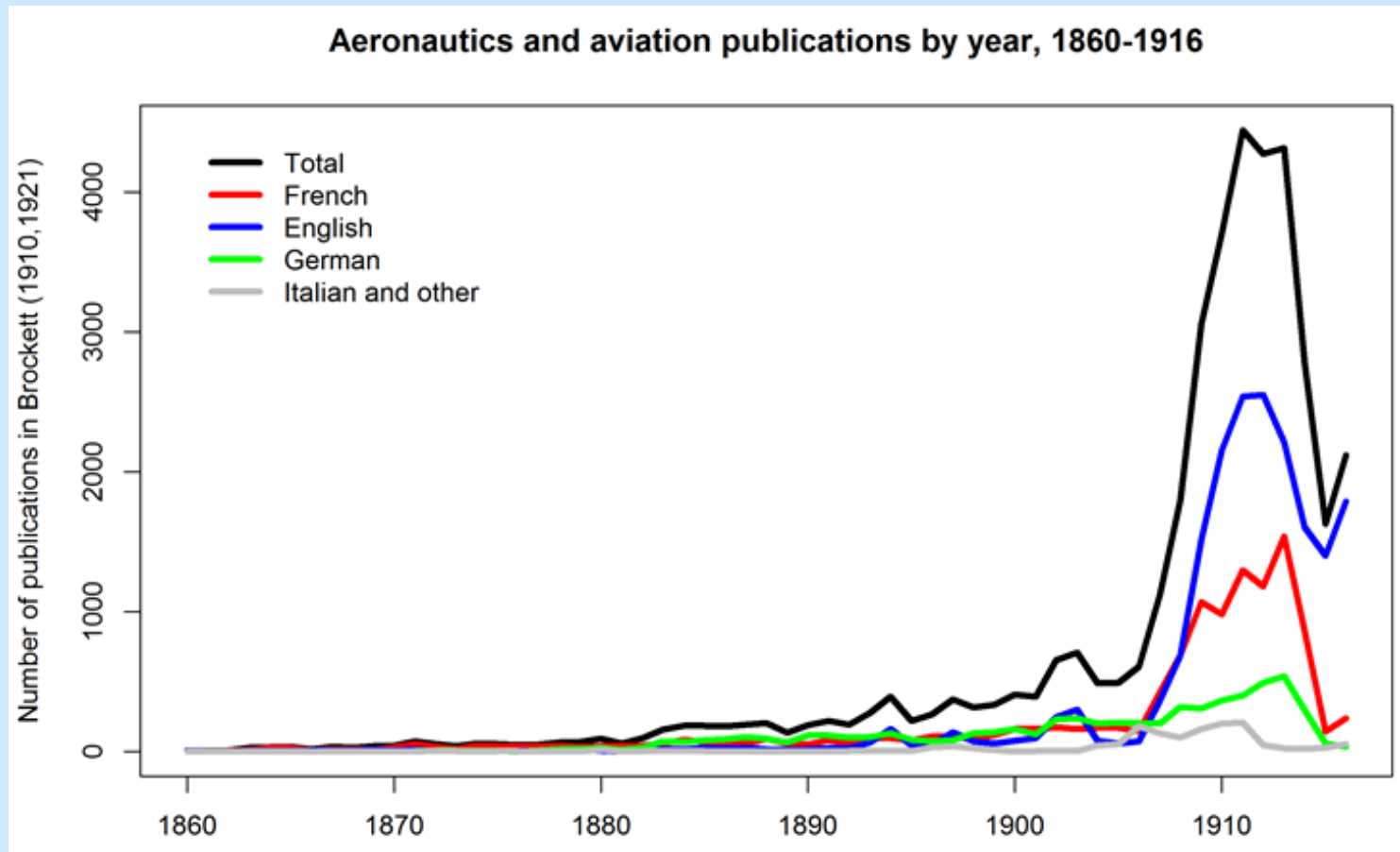
Wright brothers 1901-2 kites  
and gliders



Wright 1903 powered glider



# Similar boom and decline in aero publications



Source: Brockett's *Bibliography of Aeronautics* (1910, 1921), years after 1909 are estimates. patents are excluded

1914 – notable drop during the war, especially in French, German and Italian.



# Patents boom for all flight technologies after 1906, then wings/airfoils take over

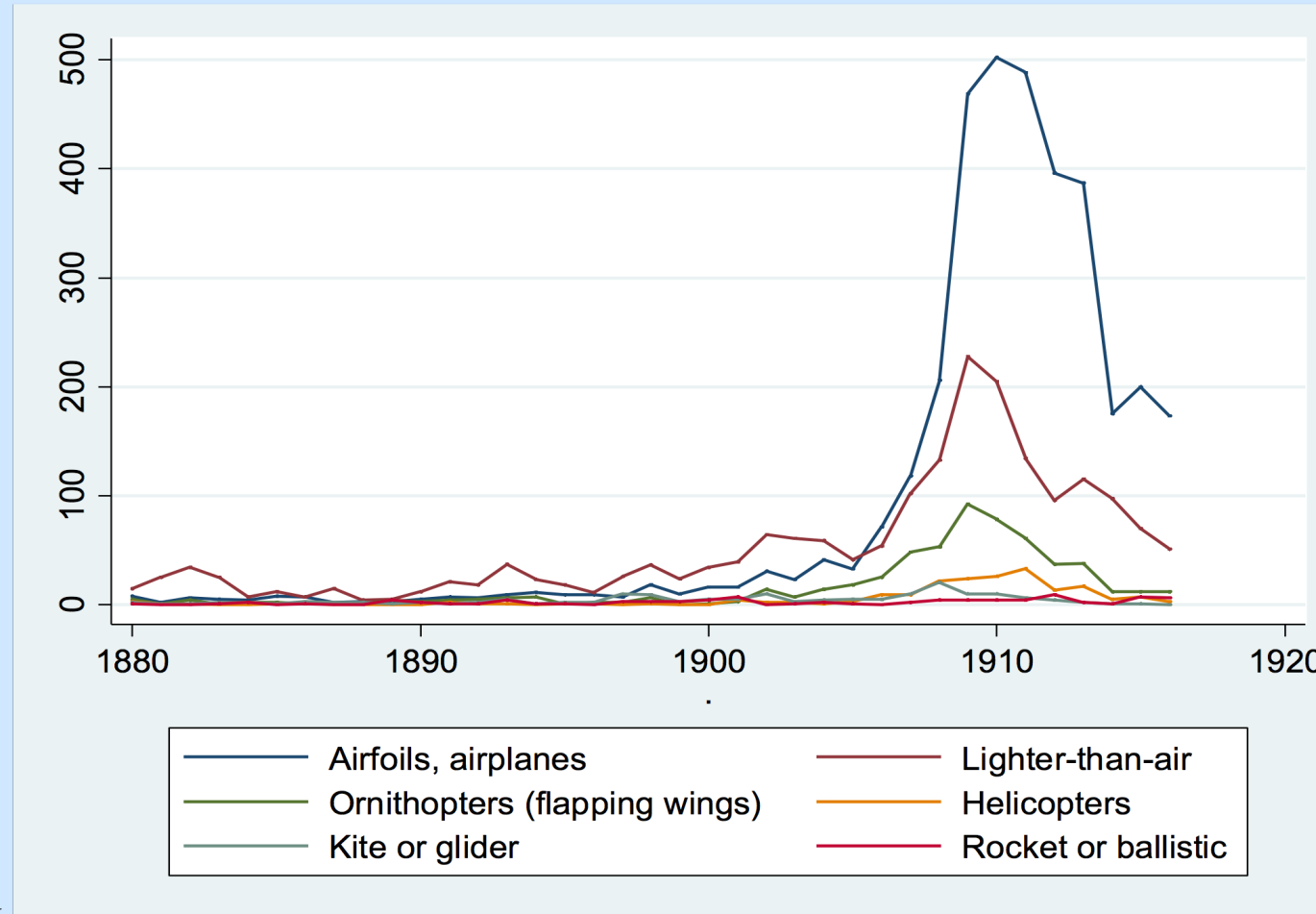
Sample count of aero patents per year, in any country

**Proportion related to airplanes rises from 10% to 50%**

Balloon patents had been most common till 1906 (“Lighter-than-air”)

Proportion of balloons falls from 50% to 15%

Many patents not yet coded by technology

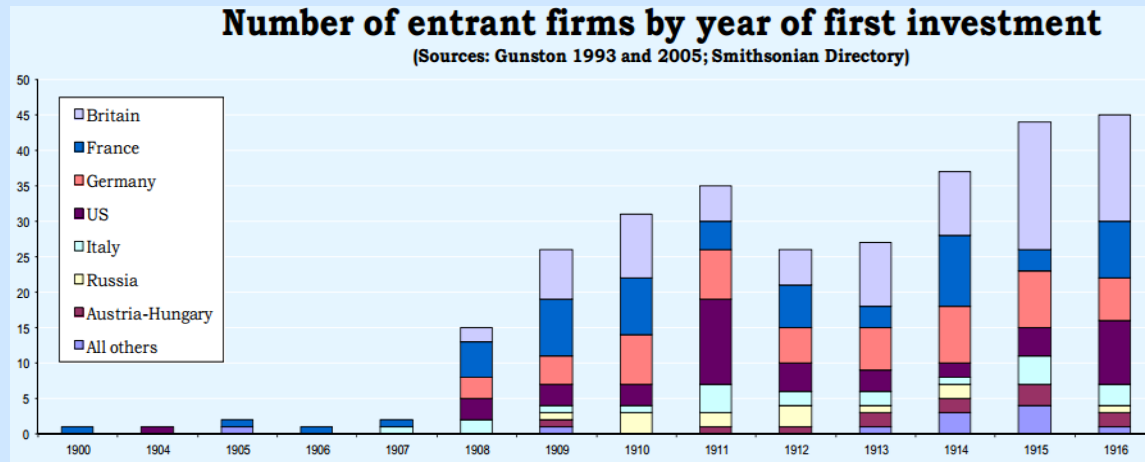


# 1908-13: Startup industry

New firms appear in industrial countries especially in Europe.

Most were started by industrialists, NOT by tinkerers.

That was possible **because knowledge of how to make an airplane was in the open.**



Big exhibitions in 1909-12. 100,000s of people buy tickets.

Vast growth in airplane-making, exports, hours worked in this sector, revenues, military purchases (Chadeau 1987, 1996)

Aircraft companies spin off from engine-makers, automobiles, engineering, ballooning, and many other fields.

Slightly later start in Australia, New Zealand, Japan, Canada.

In Japan, military led, firms did not.

Wright brothers patent lawsuits.

# Airplane-makers spun off, or branched in, from other industries

<b>Source industry</b>	<b>Firms making airplanes in 1908-1916 (including military establishments)</b>
<b>Engines, turbines</b>	20
<b>Autos, railcars, carriages</b>	14
<b>Ships, boats</b>	10
<b>Flying school</b>	9
<b>Airships, balloons</b>	8
<b>Ordnance</b>	3
<b>Electric</b>	3
<b>Bicycles, motorcycles</b>	4
<b>Other engineering</b>	16
<b>Auto repair</b>	2
<b>Other business</b>	4

- Spinoffs, as per Klepper: key people came from the other industry
- In Europe & U.S. only 10-20% of firms were started mainly by a tinkerer with experience in aero experimentation ; many of those disappear immediately
- Instead: manufacturing experience
- Most firms had someone with experience at an airplane-maker already!

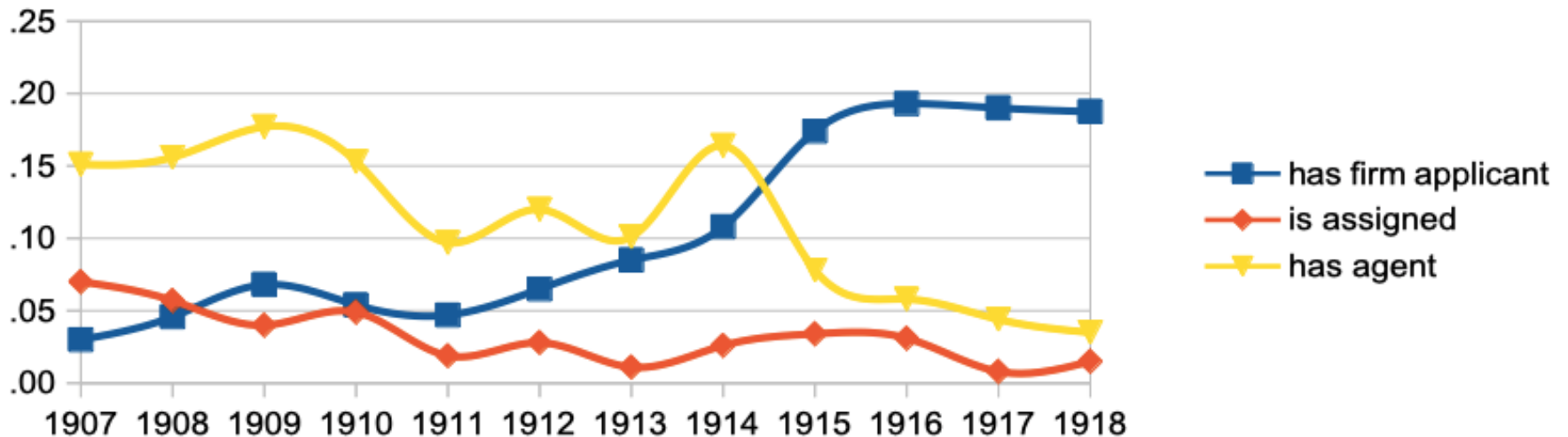
# Airplane-makers spun off or branched in from other industries

<b>Source industry</b>	<b>Firms making airplanes in 1908-1916</b>
<b>Engines, turbines</b>	20
<b>Autos, railcars, carriages</b>	14
<b>Ships, boats</b>	10
<b>Flying school</b>	9
<b>Airships, balloons</b>	8
<b>Ordnance</b>	3
<b>Electric</b>	3
<b>Bicycles, motorcycles</b>	4
<b>Other engineering</b>	16
<b>Auto repair</b>	2
<b>Other business</b>	4

- Wave of startups 1908-1912
- Hundreds of firms involved
- Mostly "spinoffs" - founders or key technical people came from the other industry (Klepper's definition)
- Only 10-20% of firms were started mainly by a patentee/experimenter.
  - Instead: manufacturing experience
- Most firms had someone with experience at an airplane-maker already!

# Relations of patentees to firms

- 1) An **applicant** for a patent may be a firm or other org, along perhaps with an inventor. Probably the firm paid for the R&D that produced the patent. No strong trend in firm-applicants during the spike, but an increase in World War 1.
  - 2) A firm might buy (be “**assigned**”) the patent rights, the intellectual property. Revenues came mostly from exhibitions in this period, not yet from sales of aircraft.
  - 3) An inventor may have hired a **patent agent** to file with the patent office. No strong change in the time of the patent spike. Procedures and data on this varies by country.
- In chart: proportions of aero patents showing these relationships in sample coded so far.



# Model: Tinkerers in networks

Assume there are motivated tinkerers, or problem-solvers with intrinsic or altruistic objectives (Meyer 2007, 2011, 2015)

Assume each has a way to make “progress”, by their own definition

Assume total technological uncertainty

➤ No market, no product competition, no company R&D

➔ Tinkerers are willing to work on their own

➔ Tinkerers would be willing to agree to share information

➔ And to standardize and specialize to improve sharing efficiency

Standardization and specialization are *natural* in tinkerers' networks

A shared journal or club might help sharing in the network

➔ A tinkerer might be willing to run meetings or edit a journal

➔ Networks of tinkerers can create institutions

# Innovative contribution of each patent?

How to measure "quality" beyond counting each one as one patent?

- Many are duplicative or unclear
- Don't have modern "patent citations", nor rejected patent applications, nor computerized text, nor company value

Possible quality measures:

- Whether patent is an **addition**, or **foreign filing** – requires study and coding
  - **In the boom there are many more foreign filings**
- Whether invention ever patented in a country with an examination.
  - For novelty, usefulness, feasibility
  - E.g. Germany, U.S., Sweden, Chile
- Fees paid
- Patents that seem clear and good now, and well-classified

Not all is implemented. Advice is welcome.

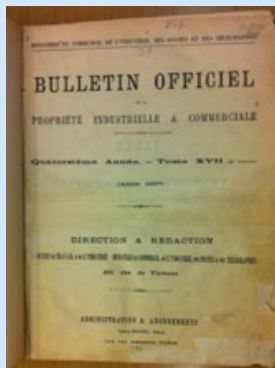
# Many data sources for patents

Most comes from European Patent Office & World Intellectual Property Organization

- Espacenet - covers back to ~1890-1910, varying by country
- Patstat - Thanks to WIPO's Julio Raffa and Intan Hamdan-Livramento
- US: Google patents, USPTO web site; tech category 244; ; Simine's Aviation Patents list
- France: Online INPI.fr historic patent database; *Catalogue des brevets d'invention, 1880s*, USPTO's *Subject-Matter Index of Patents for Invention, France (1883)*; *Bulletin Officiel de la Propriété Industrielle (1880s)*; *L'Aérophile* issues 1898-1905; *Aéro-Manuel, 1914*
- Britain: Brewer and Alexander's *Aeronautics*, 1893; *Aeronautical Journal* issues, Neilson 1910
- Germany: Otto-Lilienthal museum site; Alexander-Katz, 1912; DPMA site
- Norway: *Norske Patenter Register*, various years
- Sweden's are online, not mostly gathered yet
- Overall we have about 14,000 aero-related patents up to 1916

**Challenge: A patent's data relevance to aeronautics/aviation not always clear**

**Challenge: Very limited data on some, e.g. title, inventor last name; no tech category**



APPAREILS DE SAUTAGE, PÊCHE, CULTURE ET GRANDE PÊCHE, AÉROSTATS.  
— 210762. — 13 janvier 1891, STRETCH, rep. par Chassevent, boul. Magenta, 11, Paris. — Perfectionnements dans les hameçons.  
— 210861. — 19 janvier 1891, REYNAL, élisant domicile chez le sieur Foveau de Courmelles, rue du Printemps, 7, Paris. — Propulseur aquatique et aérien nommé : *Propulseur des fluides*.  
*Certificats d'addition.*  
— 191876. — 14 janvier 1891, VIVIER, rep. par Good, rue de Rivoli, 70, Paris. — Cert. d'add. au brevet pris, le 18 juillet 1888, pour un système de projection d'huile à distance sur la mer pour calmer les brisants.  
— 195306. — 14 janvier 1891,

Pu  
je  
Pa  
pr  
ar  
tig  
  
V  
1.  
  
BE  
(C  
(S  
Be  
des  
de  
  
Fen  
bou  
dym  
des

LISTE DES BREVETS  
OBTENUS EN FRANCE LE 30 AOÛT 1901 ET LE 19 SEPTEMBRE 1901 (1)

312,612. — 20 août 1901. — de Dion : Perfectionnements aux ballons dirigeables.  
312,665. — 21 août 1901. — de Dion : Perfectionnements à la construction des ballons dirigeables et à leurs mécanismes de propulsion.  
312,655. — 21 août 1901. — Schallot : Perfectionnements dans la navigation aérienne.  
312,676. — 21 août 1901. — Dugnet : Aérostat dirigeable.  
312,682. — 21 août 1901. — Blouin : Nouveau système de ballon dirigeable.  
312,689. — 22 août 1901. — Hébert : Planophile le « Georges Hébert », nouvel appareil d'aviation.  
312,758. — 25 août 1901. — Lemoine : Perfectionnements aux aéroplanes.  
312,796. — 26 août 1901. — Delaurier : La navigation aérienne pyrotechnique.  
312,957. — 2 septembre 1901. — Turry : Nouveau système de ballon.  
312,962. — 3 septembre 1901. — Fagnier : Perfectionnements dans l'aérostation.  
312,995. — 4 septembre 1901. — Turak : Machine à voler.  
314,495. — 7 septembre 1901. — Vroland : Système de ballon dirigeable.  
314,116. — 10 septembre 1901. — Riedinger : Hélice aérostatique à poids formant volée.  
314,297. — 12 septembre 1901. — Magnin : Nouveau ballon dirigeable.  
314,219. — 13 septembre 1901. — Guillaume : Perfectionnements apportés aux dispositifs employés dans la navigation aérienne.  
314,368. — 19 septembre 1901. — Piatti del Pozzo : Aérostat dirigeable.

(1) Communication de MM. Maillier et Babelot, Office International pour l'Étude de la Propriété Industrielle en France et à l'Étranger, 32, boulevard Dornier-Nouvelle, Paris.

PARIS. — IMPRIMERIE TRAITÉ-UNION, 7, RUE BOULEVARD. — Le Directeur général : GEORGES BESANCON.