Using Patents as examples of Technological Advancement

SREDStakeholder.CA

Bell vs. Eurocopter

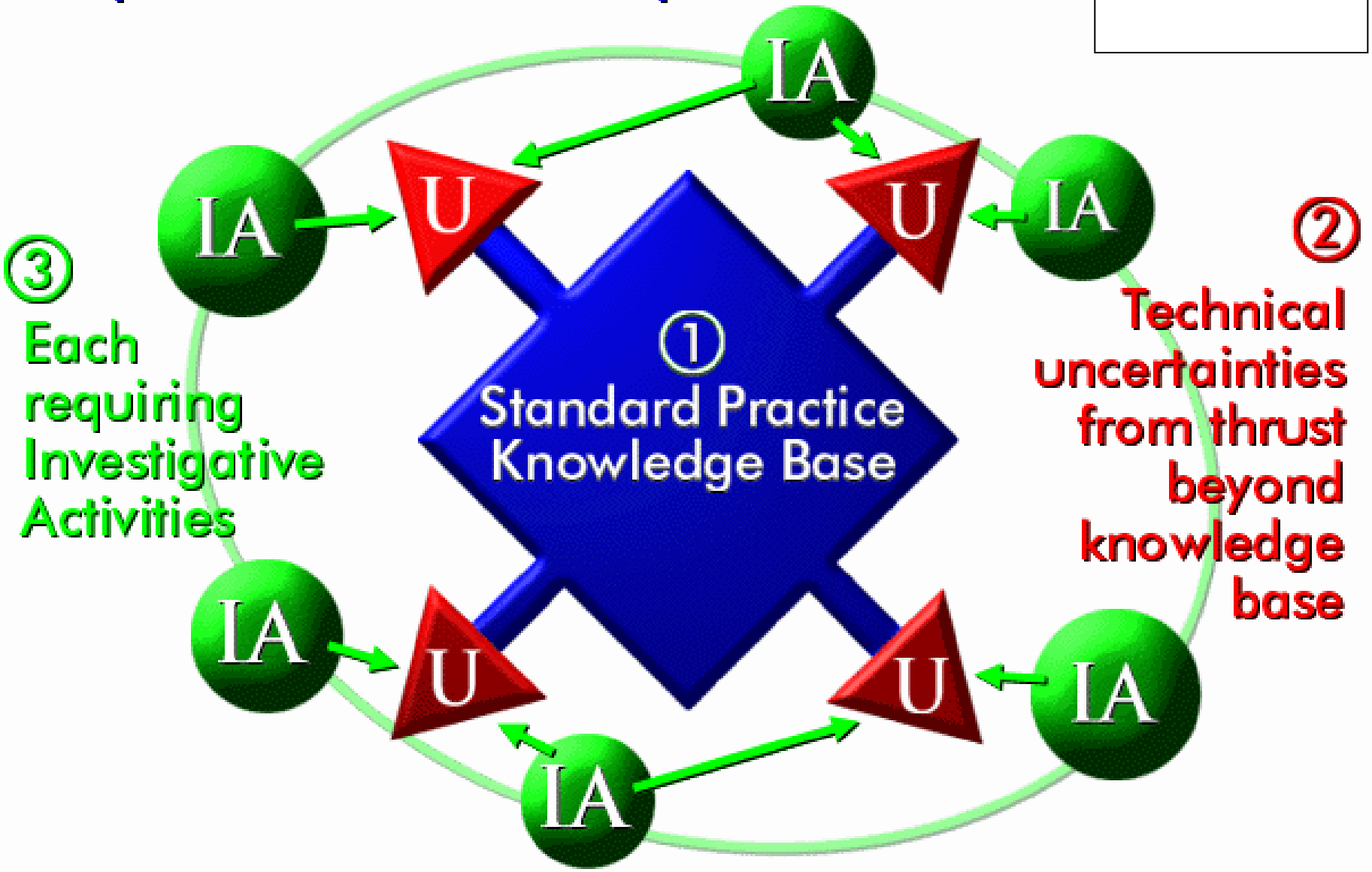
Presented by Ben Mak, BASc., LLB

International Definition of an R&D project

- "For a … project to be classified as R&D, its completion must be dependent on a scientific &/or **technological advance**, the aim of the project must be the **systematic resolution** of a scientific and/or **technological uncertainty**."

- Source: Frascati Manual 2002, paragraph 135

The Realm of Experimental Development



SR&ED - ITA 248(1) Definition

"**Scientific research and experimental development** means **systematic investigation … in a field of science or technology by experiment or analysis** that is:

- (a) **basic research**, for **advancement of scientific knowledge** without specific practical application in view,
- (b) **applied research**, for **advancement of scientific knowledge** with specific practical application in view, **or**
- (c) **experimental development**, for the purpose of achieving **technological advancement** for the purpose of **creating new, or improving existing**, **materials, devices, products or processes, including incremental improvements thereto**

CRA guidelines – Defining "Technology Base"

Technology base or level … includes:

- technical knowledge ...of its personnel;
- current products, techniques, methodologies (trade secrets & intellectual property).
- **publicly available sources** … publications, journals, textbooks, internet-based information & expertise ... through employees or contractors.

The technology base will vary from company to company even though the **knowledge available publicly remains the same**.

Source: CRA SR&ED Glossary Dec. 19, 2012 SR&ED policy papers

Using patent cases to illustrate TA

Benefits

- Similar focus on Technological Advancement
- Rules similar internationally
- Often deeper analysis vs. tax court judgments
- Examples for SR&ED claimants self assess
- Encourage integration with SR&ED process

Landmark decision defining Technological Advancement

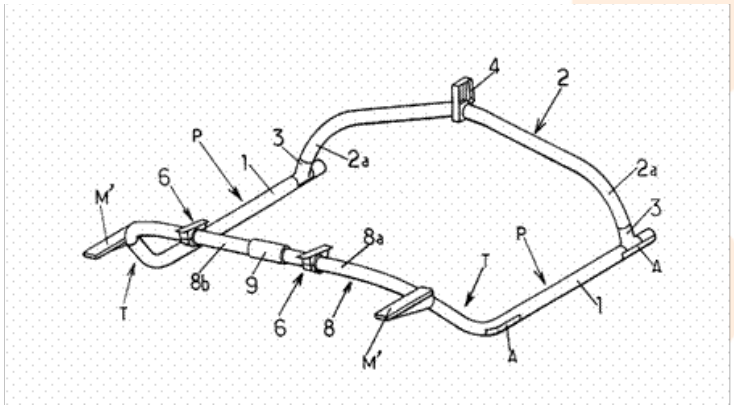
- ***2012 FC 113* - *Eurocopter v. Bell Helicopter***
  - *Patents: Sound Prediction*
  - *Patents: Punitive damages*

Key Criteria Summary

2101 - Bell vs. Eurocopter - Patent Defense analysis					
BENCHMARKS	**ACTIVITIES BY YEAR**				
Internet searches: 1 Articles	2021				
Competitive products or processes: 4 products	'1-1	'1-2	'1-3	1-4	'2-1
Similar prior in-house technologies: 1 products / processes	Legacy Landing gear - infringes patent	Experimental exception defence	Prior art defence	Determining $ damages	Production landing gear does NOT infringe patent
OBJECTIVES	**RESULTS**				
Eliminate ground resonance instability: 1 1=yes / 0= no	1				1
load distribution: %					
UNCERTAINTIES & KEY VARIABLES	**CONCLUSIONS**				
1 - Defining prior art vs. Eurocopter patent					
define transition zones	Y				
double curvature of transition zones	Y				
integrated front cross piece	Y				
moustache or sleigh shape	Y				
2 - Advancements in Bell vs. Eurocopter patent?					
attach cross piece with saddle joint - stiffness?					Y
eliminate double curvature					Y
resulting pitch & roll frequencies					Y
	METHODS				
Analysis					
Trials					
Prototypes	21				30
	COSTS				
Hours	3776				4500
Materials $	100000				150000
Subcontractor $					

Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.



v.

Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.

- **Overview**
  - "Classic patent infringement/invalidity scenario"
  - Eurocopter claims infringement of Canadian Patent No. 2,207,787 (the '787 patent), directed to skid-type "moustache" landing gear
  - (Patent written in French – English translation used by Court)

Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.

- **Overview**
  - Bell sued over two landing gear designs: "Legacy" and "Production" gear

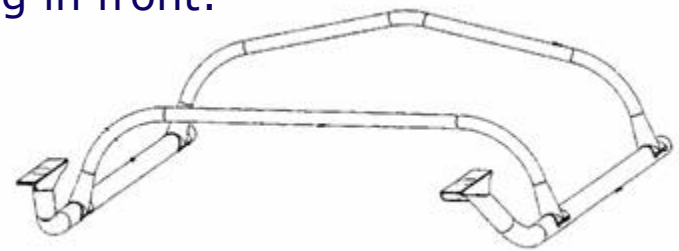
"Production" landing gear "Legacy" landing gear

  - Claims 1, 2, 3, 4, 5, 7, 9, 10 and 15 asserted for infringement
  - All 16 claims challenged on validity
  - All 16 claims are ***device*** claims

Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.

- **Basic Facts**
  - The patent sets out a number of advantages of the "moustache" design over a conventional skid-style gear having two skid ends protruding in front:



(a) Elevated acceleration factors upon landing (load factors);

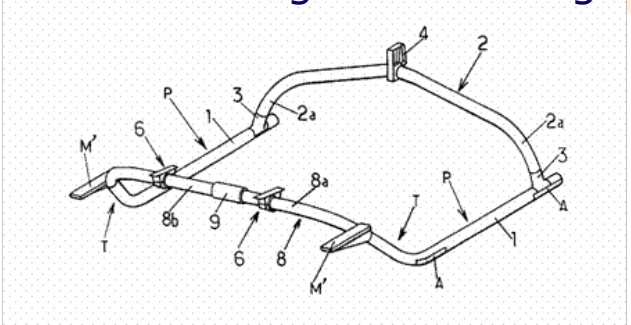
(b) Difficult frequency adaptation with respect to ground resonance; and

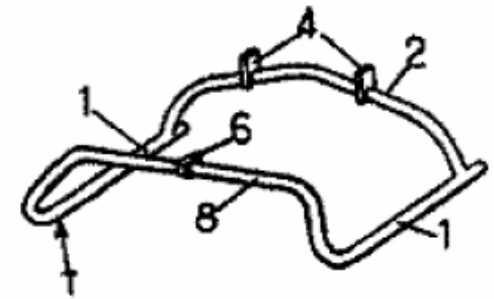
(c) High landing gear weight.

Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.

- **Basic Facts**
  - Claim 15 covers an embodiment wherein the front "moustache" cross-piece is inclined forward from where the skids touch the ground
  - Claim 16 covers an embodiment wherein it is inclined backward
  - Claims 1-14 do not specify direction of inclination
  - Eurocopter had only tested and demonstrated the stated advantages for a version of the moustache landing gear corresponding to Claim 15
  - Patent had figures showing both variants (e.g. Fig. 1 & 11e)





Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.

- **Issue #1: Sound Prediction**
  - Court holds that these three stated advantages constitute a "promise" of specific utility (following Hughes J. in *Mylan Pharmaceuticals* (2011))
  - Court then proceeds to ask whether, at the filing date, the patentee had sufficient information upon which to base the promise
  - Expert evidence suggests that the backwards inclination might have disadvantages (e.g. it might be more susceptible to buckling)
  - In the absence of evidence to support the backward-inclined embodiment meeting the promise, the Court finds a lack of ***demonstrated*** utility in Claim 16 as of the filing date

Eurocopter v. Bell Helicopter

2012 FC 113, Martineau J.

- **Issue #1: Sound Prediction**
  - Court goes on to invalidate Claims 1-14 on the same grounds because they encompass the backward-inclined embodiment shown in Fig. 11e of the patent

- **The test for sound prediction / overbreadth**
  - A claim may be invalidated for lack of demonstrated utility or overbreadth if:
    - the patentee cannot ***soundly predict*** as of the ***filing date*** that
    - ***all*** embodiments (or maybe just all ***described*** embodiments?) encompassed by the claim
    - demonstrate ***all*** of the stated advantages (or maybe just some?)
    - this is true even for patents having ***only device claims***

Eurocopter v. Bell Helicopter

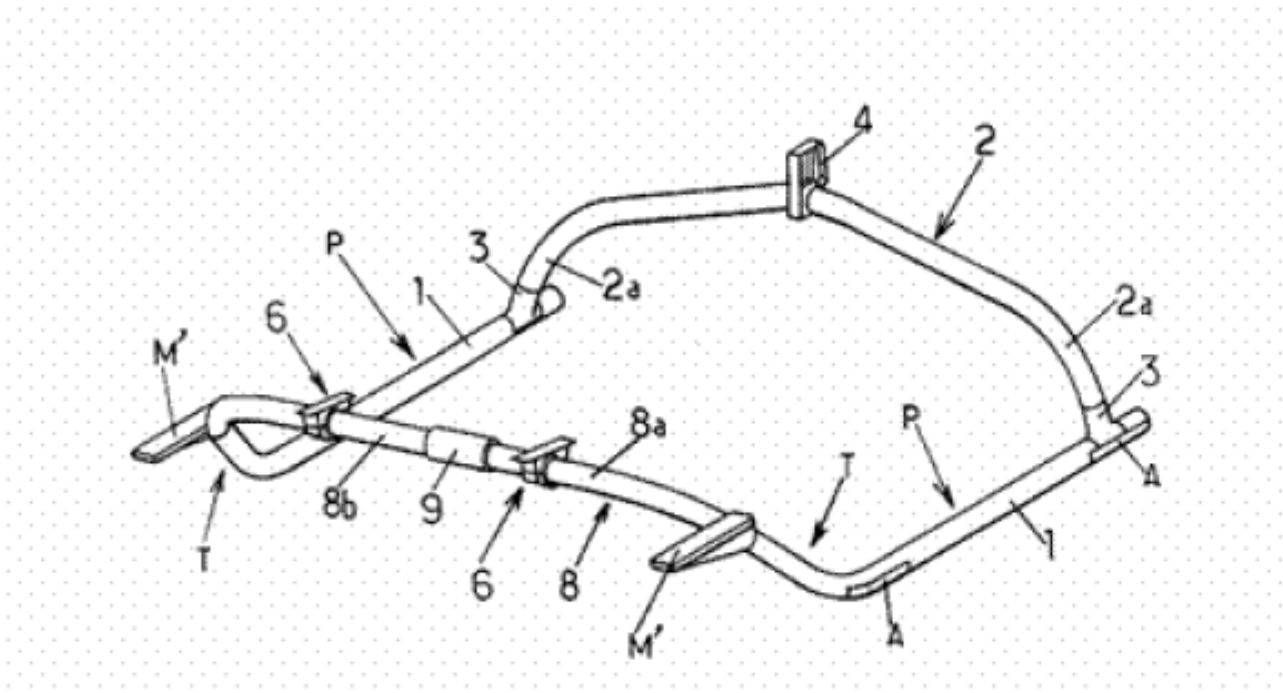
2012 FC 113, Martineau J.

- **Issue #2: Punitive Damages**
  - Bell held to infringe claim 15 with both designs
  - Court doesn't believe Bell's evidence that they had no knowledge of the patent
    - Bell trained its employees on a leased Eurocopter EC120 vehicle having the new landing gear design
    - These employees proposed the Bell "Legacy" design shortly thereafter: it's a "slavish copy" of the Eurocopter design
    - Court finds that Bell knew the new design would infringe the patent but ignored these concerns when raised
  - Bell's sophistication and bad faith justify punitive damages
  - Quantum of punitive damages to be determined later (bifurcated proceedings)

Bell vs. Eurocopter
Landing gear layouts

Eurocopter “Moustache” landing gear

[9] Figure 1 of the ‘787 Patent is an isometric view of the Moustache type landing gear:



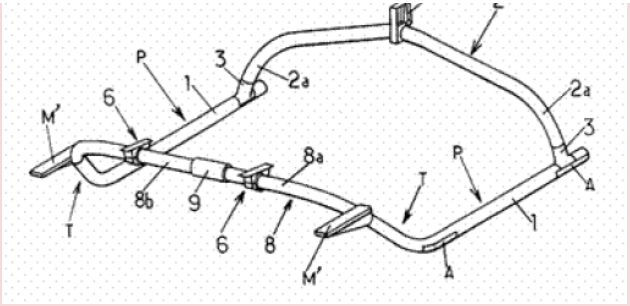
Eurocopter “Moustache” landing gear

Claim 1 (translated)

1. Helicopter landing gear, comprising two skids each having a longitudinal ground support surface and connected to a front cross piece and a rear cross piece which are themselves attached to the structure of the helicopter by connecting devices, the rear cross piece being attached by the ends of its descending branches to the rear part of said longitudinal support surfaces,

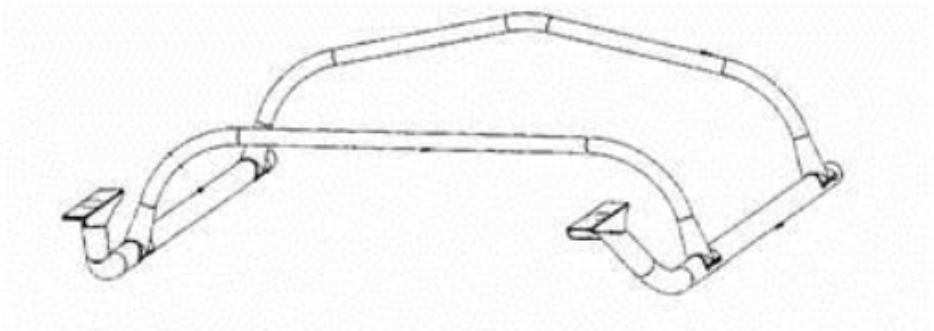
characterized in that each of said skids has at the front an inclined transition zone with double curvature orienting itself transversely in relation to said longitudinal ground support surfaces, above the plane of the latter,

the two transition zones together constituting, in this way, an integrated front cross piece, offset in relation to the front delimitation of the plane of contact of the longitudinal support surfaces of the skids on the ground.



Conventional design

skid-type helicopter landing gears. The common general knowledge in the field of conventional skid-type landing gears was thus defined under prior art by an orthogonal design having long, straight and usually circular tubes oriented longitudinally, ending with a short ski type protrusion at the front end, similar to the general design shown on the isometric view set out at para. 209 of the Reasons, and here reproduced:



In this conventional design, the front and rear cross pieces are parallel with respect to each other and they are perpendicular or substantially perpendicular to the ground skids. Both cross pieces are attached to the ground skids by way of a saddle or "tee" attachment.

Moustache design specifics

[27] The Judge also concluded the “double curvature” of transition zone is obtained first by

- a “fairly large” bend when the skid’s cross piece bends upwards (C1 figure), then a

- second bend where the cross piece extends horizontally to meet the fuselage (C2 of figures)

- as in figures 4a, 4b and 10 of the ‘787 Patent

Moustache design specifics

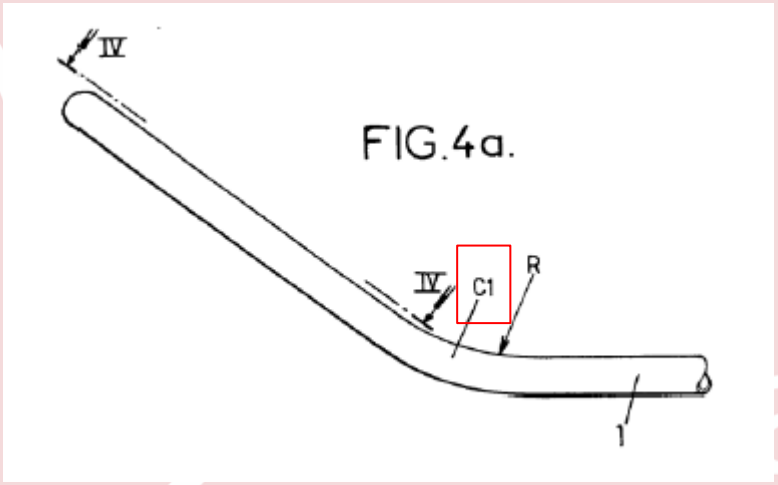


FIG.4a.

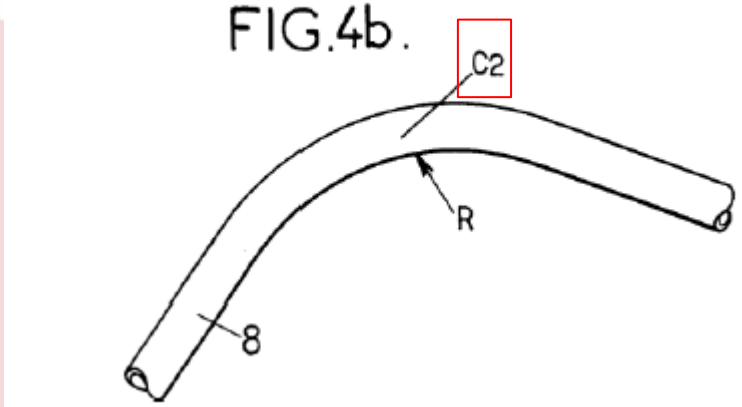


FIG.4b.

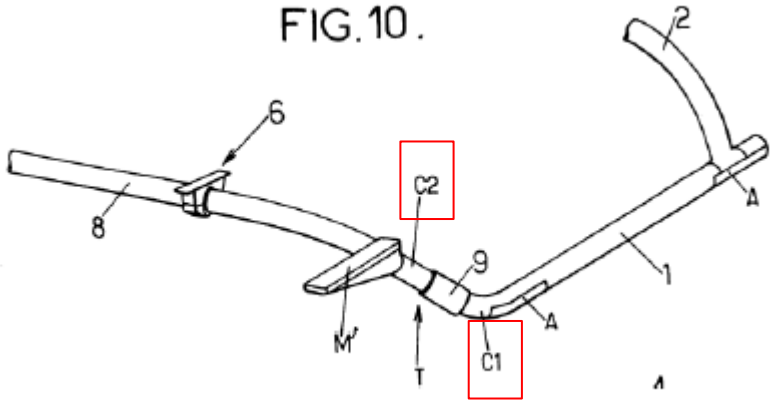
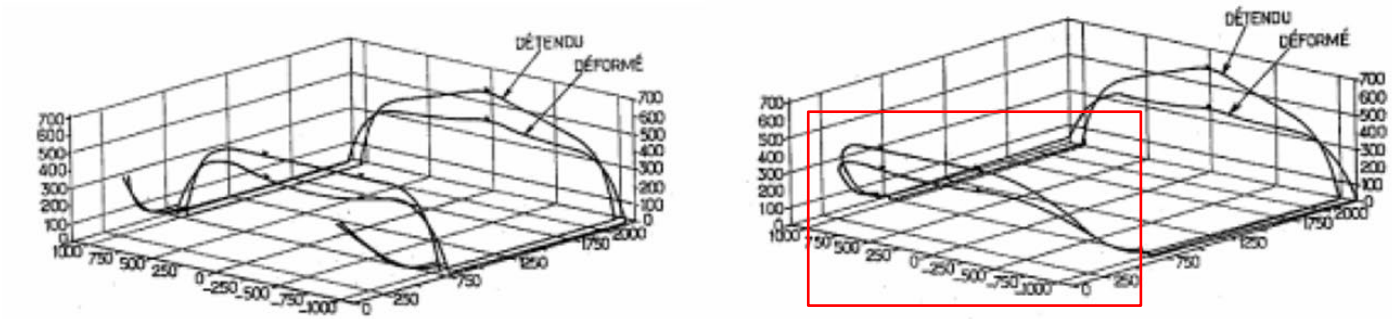


FIG.10.

Moustache vs. Conventional

[47] The Judge also found (at paras. 322 and 329) that the '787 Patent disclosed the best mode of the invention and was clear enough to allow a skilled person "to understand the general functioning of the claimed invention and its main features." He found that Figures 12 and 13 set out in the patent were particularly enlightening to show how the Moustache landing gear's integrated front cross piece will contribute to the overall energy balance and will play, thanks to the bending of the transition zones, a leading role for the absorption of those forces generated during rough and running landings. These figures are reproduced below and show perspective views of the deformations of a conventional landing gear (left) as compared to the Moustache landing gear (right):

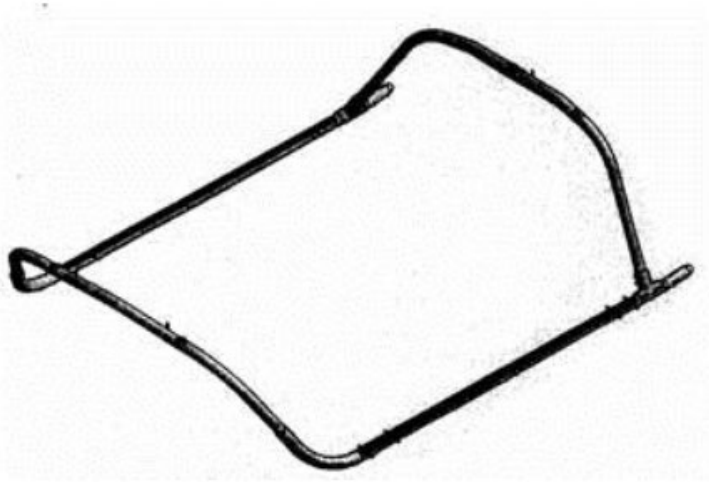


Moustache vs. Conventional

- [48] Judge .. particularly satisfied
- in light of the actual testing carried out,
- inventors had demonstrated .. claim 15 in which
  - integrated front cross piece
  - is offset forwards in relation to the front delimitation of the plane of contact
  - of the longitudinal support surfaces of the skids on the ground.

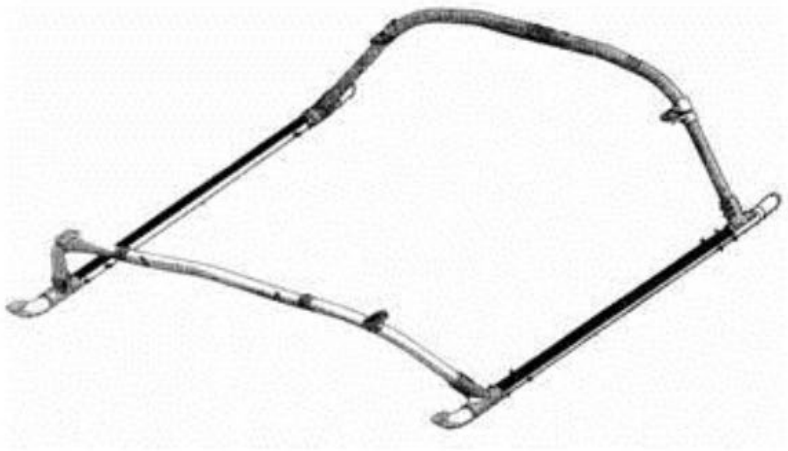
Bell Legacy landing gear

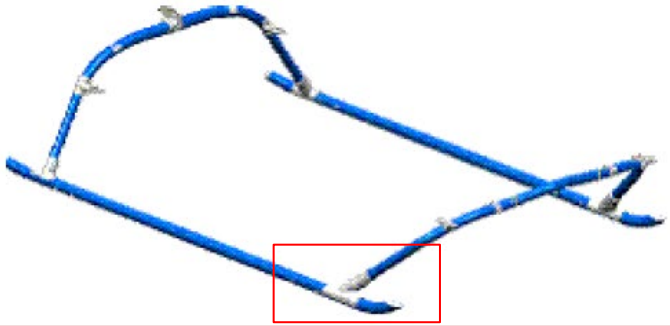
[13] The sleigh type Legacy landing gear was made or assembled by Bell Helicopter in March of 2003: Reasons at para. 171. The Judge reproduced the following isometric views of the Legacy landing gear at paras. 23 and 394 of the Reasons:



Bell Production landing gear

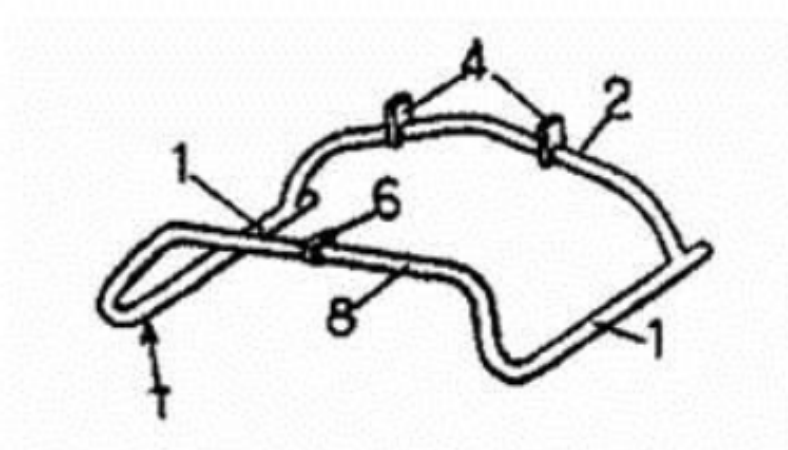
[16] The Judge reproduced the following isometric views of the Production landing gear at paras. 25 and 395 of the Reasons:





Bell claim 16 - Backwards offset NOT accepted by judge

[49] However, the Judge was not convinced that there was sufficient evidence or data to support a prediction with respect to the promised utility of the embodiment of the invention set out in claim 16 of the '787 Patent. That claim provides for an embodiment in which the integrated front cross piece of the landing gear is offset backwards in relation to the front delimitation of the plane of contact of the longitudinal support surfaces of the skids on the ground. That embodiment is illustrated in Figure 11e of the patent, reproduced below:



Lessons for SR&ED claimants

- discuss with Ben

What if case happened today

- New tools to search patents & prior art
- Let's examine how to use public information to build prior art review for SR&ED project

Example of recent study 2020

CEAS Aeronautical Journal (2020) 11:731–743
https://doi.org/10.1007/s13272-020-00452-z

ORIGINAL PAPER

Check for updates

Influence of contact points of helicopter skid landing gears on ground resonance stability

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Received: 25 November 2019 / Revised: 6 March 2020 / Accepted: 8 April 2020 / Published online: 23 April 2020

Abstract
Soft-in-plane rotor systems are susceptible to a self-induced vibration phenomenon called ground resonance. This dynamic instability results from lag motions of the rotor blades coupling with airframe degrees of freedom, while the helicopter is in ground contact. As an addition to slope landing studies in the past and investigations of non-linear landing gear effects, this work focuses on a systematic study of partial skid contact. A ground resonance test environment was created. It encompasses

Methods & Issues Explained

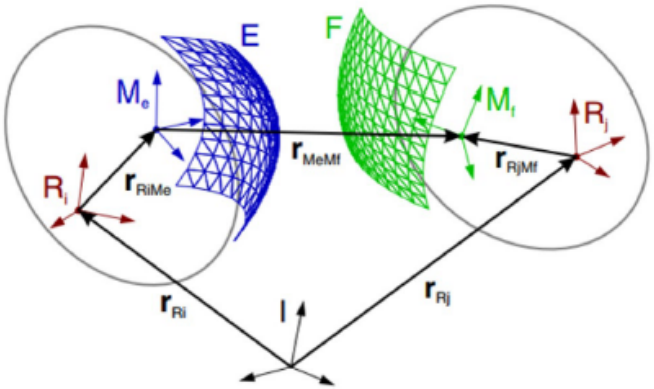

Fig. 13 Intersecting area of the surfaces and corresponding contact patches

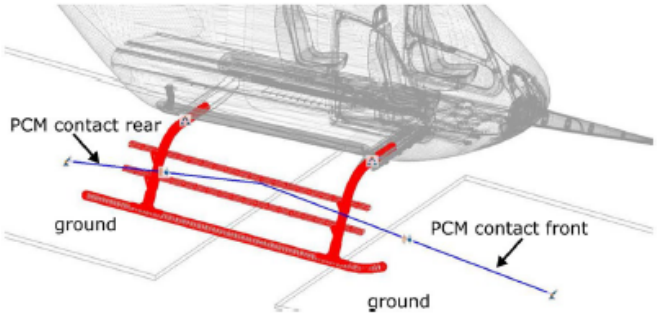

Fig. 14 PCM contact of the EC135 landing gear

without complex a priori consideration, resulting in a straight-forward model setup as seen in Fig. 14.

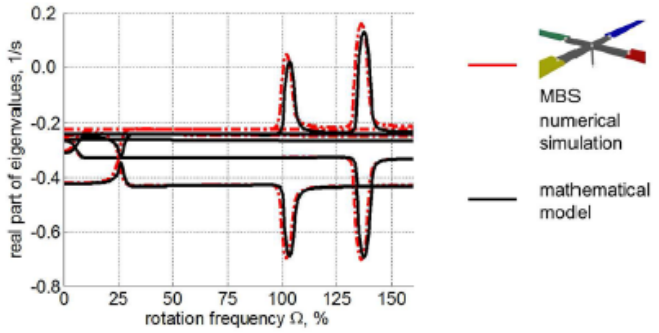

Fig. 15 Hub motion eigenvalues in *x*- and *y*-direction

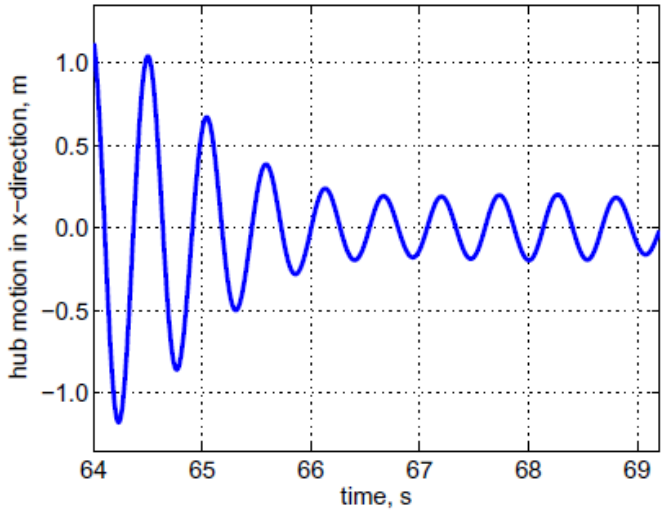

Fig. 16 Filtered sensor measurement of longitudinal hub motion

New models for Ground Resonance

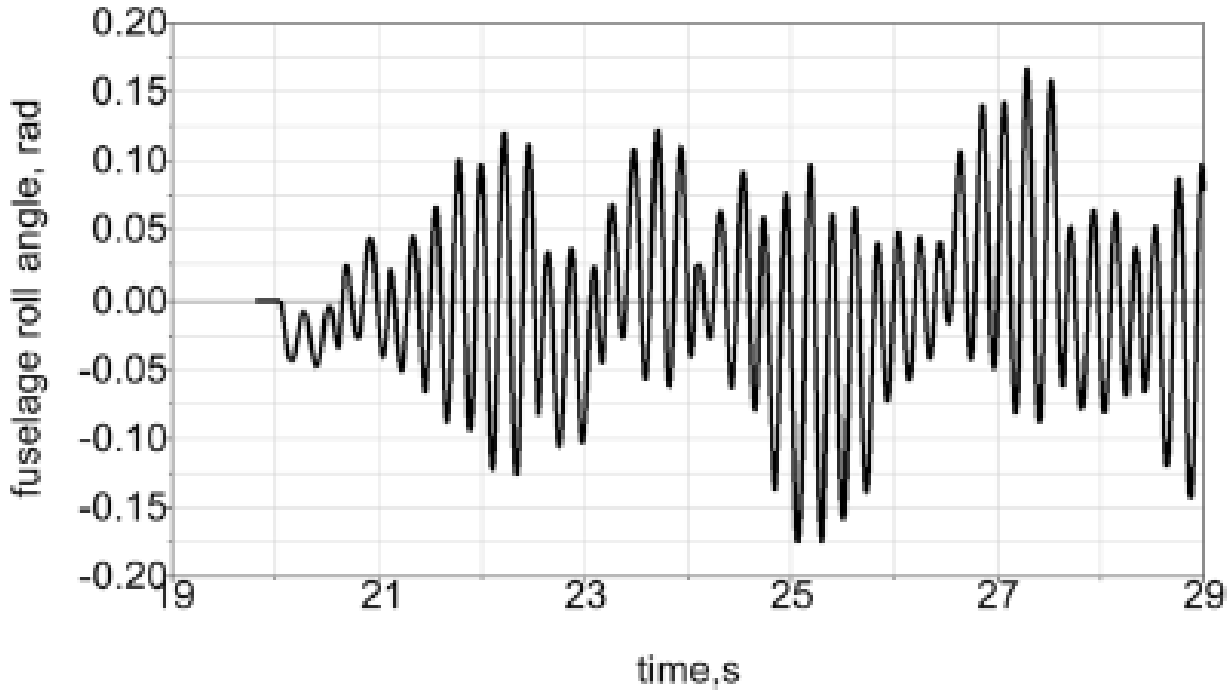

Fig. 27 Roll angle of fuselage and PCM contact in ground resonance

Variability in performance

Table 1 Eigenfrequencies of FHS landing gear modes for fixed boundary conditions

Modes	Fixed attachment (Hz)	Elastic attachment (Hz)	Absolute difference (Hz)	Relative difference
1	18.818	14.810	4.008	−0.213
2	31.171	24.201	6.970	−0.224
3	32.045	26.628	5.417	−0.169
4	33.860	53.819	19.959	+0.589
5	35.764	59.856	24.092	+0.674
6	58.480	60.714	2.234	+0.038
7	62.454	69.958	7.504	+0.120
8	70.166	74.136	3.970	+0.057
9	72.956	78.998	6.042	+0.083
10	75.561	82.237	6.676	+0.088

Technological Uncertainty 2020

It was shown that

- for the modal reduction approach, a special attention has to be given to the landing gears attachment to the fuselage.
- The selection of these “master nodes” is imperative for correct eigenfrequencies and bearing loads.

Eligible SR&ED in 2021?

The study showed signs of two counteracting effects.

- On one hand, reduction of restoring forces should lead to more unstable conditions according to current literature.
- On other hand, energy dissipation shows larger influence on system stability behaviour after sudden disturbance.
  - Especially on soft-terrain like sand or gravel

The second effect is of major interest.

- To investigate these effects tests are necessary.

Structure for systematic investigation

- Current work represents framework for further investigation of this contact type and extensive parameter studies of ground resonance.

Future cases for discussion?

- Lilly v. Novopharm – requirements in defining Standard Practice (2007)
- Bilski – Technological vs. Business advancements in software (2010)