

SESA6085 – Advanced Aerospace Engineering Management

Lecture 21

2024-2025

Dr David Toal

Module Recap

- Probability theory, uncertainty
 - Project uncertainty management
 - Scheduling & supply
 - Business continuity management
 - Cyber security
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- Today we focus on another aspect of security and a potential source of risk – intellectual property & export control

Intellectual Property

Intellectual Property

- A successful technology business normally has a unique selling point (USP) and some proprietary technology
 - For large organisations there may be several such items
 - For small organisations perhaps there is only one
- Improper handling of intellectual property can potentially have disastrous consequences for an organization
 - Loss of USP
 - Loss of the right to use a technology
- Being aware of the approaches for managing IP and the potential pitfalls is the first step to mitigating this risk

What is IP & IPR?

- Intellectual property (IP) covers creative and innovative ideas that you own e.g.
 - A story
 - An invention
 - An artistic work
 - A symbol
- Intellectual property rights (IPR) are your rights to use and indeed protect your IP
 - These allow you to make money from IP you own

IP Ownership

- You own IP if you...
 - Created it
 - Bought the rights from a previous owner
 - Have a brand that could be a trade mark
- IP can...
 - Have more than one owner
 - Belong to people or businesses
 - Be sold or transferred

Types of IP Protection

- By protecting your IP you make it easier to take action against anyone attempting to steal/copy it
- IP protection is broken down into two categories registered and unregistered
 - Registered – a record is retained
- IP protection, depending on the form, can take a significant amount of time to achieve

Trade Secrets & Know How

- There's no registration process for know-how or trade secrets
- As the name suggests this requires secrecy e.g.
 - Confidentiality agreements, NDAs, other contractual agreements
 - Obscuration, hiding, disguising etc.
- Generally, this covers minor details that make something work better e.g.
 - Machining settings e.g. feed rates
 - Recipes and ingredients etc.
- Can be licensed or sold
- Unlimited duration with no real costs

The Coca-Cola logo, featuring the brand name in its iconic red script font.

Copyrighting

- Applies to written works, art, films, music, photos etc.
- This is an automatic process there is no need to pay a fee
- You automatically obtain the copyright when you create an original work
 - Mark the work with © your name and year
 - You don't have to mark the work your level of protection is the same
- It protects you against unauthorized copying, distribution, renting, performing, adaptations or posting on the web
- Depending on the type of work this can last for up to 70 years

Registered Designs

- Registering a design helps to protect the appearance of a product
 - Shape, packaging, patterns & decoration
- Registering a design offers up to 25 years of protection
 - Must be renewed every 5 years
 - Unregistered designs are protected for 15 years
- Registering requires that the design...
 - Is new
 - Has individual character – not remind an informed person of an existing design
- Costs ≈£50 and takes 2-3 weeks

Registered Designs

- You cannot register
 - Offensive material
 - Designs using national flags or official emblems e.g. coats of arms
 - Functionality of a design
- Registering helps to prove that a design is yours and when it was made
 - Secures a period of exclusivity
 - Prevents others trading similar products or designs
 - Provides a framework for licensing and income through royalty payments

Trademarks

- Trademarks enable you to protect a brand e.g.
 - Words, sounds, logos, colours, smells
 - Combinations of the above
- Registering a trademark enables you to...
 - Take legal action against anyone using your brand without permission e.g. counterfeiters
 - Put the ® symbol next to your brand – warning others not to use it
 - Sell or license your brand

Trademarks

- Registered trademarks last for 10 years
 - This must be renewed every 10 years
- The process costs at least £170 and takes 3-4 months to be granted
- Trademarks can be unregistered
 - Signified by the letters TM
 - Costs nothing
 - Does not offer the same level of protection
 - There is no official granting process so the date of the trademark is not clear
 - Instead rights are accrued through time and reputation and may be linked to a location

Patents

- Patents offer protection for products and inventions
- In order to grant a patent the invention must be
 - New – not publicly available anywhere in the world including descriptions in publications
 - Inventive – not an obvious change to something already existing
 - Something which can be made or used, a technical process or a way of doing something
- Patents grant the holder exclusive rights for 20 years
 - In return this requires a fee to be paid and full technical disclosure
 - The requirement for full technical disclosure requires careful consideration

Patents

- You cannot patent...
 - Literature, music or artistic works
 - Ways of doing business, thinking or playing a game
 - Methods of medical treatment or diagnosis
 - Scientific theory or mathematical method
 - Ways in which information is presented
 - Software with a non-technical purpose e.g. a chess playing app

Patents

- Patents only cover a particular territory e.g. UK, EU, US
- Covering more than one territory requires separate applications
 - This can greatly increase patent costs to several thousands of pounds if attempting to cover major markets
 - This can also increase the time for a patent to be granted
- Costs to the UK intellectual property office are £310, however, this does not include the cost of the patent attorney (£1000s)
- Granting a patent can take several years
- Patents do not guarantee that an invention will generate income
 - Is it worth the money? Always seek advice

Patent Workflow

1. Preparation of the application including a description, legal statements on technical features and a technical summary, drawings etc.
2. Filing of the application - IPO will do a basic check – can now include the “UK patent pending” statement
3. Search, publication and examination by IPO
 - A search to confirm that the invention is new (6 months of filing)
 - Publishing of the application (within 18 months of filing)
 - Substantive examination of the application
4. Patent granted
 - Once granted you still have to renew the patent yearly from the 5th year of filing – there’s a fee associated with this

An Example

- US20100004769A1 – “Method of designing a structure”



US 20100004769A1

(19) **United States**

(12) **Patent Application Publication**
HOLDEN et al.

(10) **Pub. No.: US 2010/0004769 A1**

(43) **Pub. Date: Jan. 7, 2010**

(54) **METHOD OF DESIGNING A STRUCTURE**

Publication Classification

(75) **Inventors:** **Carren HOLDEN**, Bristol (GB);
David JJ TOAL, Bristol (GB); **Neil**
W. BRESSLOFF, Bristol (GB);
Andrew J. KEANE, Bristol (GB)

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Correspondence Address:

LOWE HAUPTMAN HAM & BERNER, LLP
1700 DIAGONAL ROAD, SUITE 300
ALEXANDRIA, VA 22314 (US)

(73) **Assignee:** **AIRBUS OPERATIONS LTD,**
Bristol (GB)

(21) **Appl. No.:** **12/493,458**

(22) **Filed:** **Jun. 29, 2009**

(30) **Foreign Application Priority Data**

Jul. 1, 2008 (GB) 0811942.2

(57) **ABSTRACT**

A method of designing a structure, such as an airfoil section. A first set of candidate designs is generated in a first optimisation process, each candidate design comprising a set of M design variables associated with an M-dimensional design space. A subset of the first set of candidate designs is selected. The selected subset of candidate designs is analysed by proper orthogonal decomposition or principal component analysis to generate an N-dimensional design space defined by N design variables, N being less than M. A second set of one or more candidate designs is then generated in a second optimisation process, each candidate design comprising a set of N design variables associated with the N-dimensional design space.

An Example

- The timeline for the patent, in this case...
 - 2008 – Initial filing to the UK patent office
 - 2009 – Filing to the US patent office
 - 2013 – Application granted
 - 2030 – Expiration
- Actually the patent expired long before this as Airbus stopped paying the fee
 - There's naturally a trade-off between the cost of protection and the impact of not protecting the patent
- Total income from this patent - £0!

Summary of IP Protection Types

Type	IP covered	Registered?	Time	Duration	Costs
Trade secrets or know how	Minor details to make something better	No	N/A	Unlimited	£0
Copywriting	Written work, art, films, music, photos etc.	No	N/A	≤70 years	£0
Registering a design	Appearance inc. shape, packaging, patterns & decoration	No/Yes	2-3 weeks	15/25 years	£50
Registering a trade mark	Product names, logos, jingles	No/Yes	3-4 months	Unlimited	>£170
Patents	Inventions and products	Yes	>5 years	20 years	High

Defending Your IP

- Ultimately it is your (or your organisation's) job to defend your IP
- You are responsible for taking action in the event of an infringement
- You have a number of options
 - Request the party stop using your IP and come to some form of agreement e.g. a licensing agreement
 - Use mediation or similar to resolve a dispute
 - Take legal action
- It can be a criminal offence to use copyrighted material, registered trademarks or designs without permission

Using Others IP

- Infringements on your IP are one potential risk to you or your organisation
- However, another risk is potential infringement by you on someone else's IP
- The general rule is to be aware and be careful
- Know what you can and can't do without infringing IP rights
 - IP can be used as a source of information and inspiration in research, for example
 - Can't use someone else's IP for commercial purposes without their consent
 - Has the patent expired?

IP Databases

- There are numerous databases which enable you to search for patents e.g.
 - [Google Patents](#)
 - [Intellectual Property Office - GOV.UK \(www.gov.uk\)](#)
 - [European Patent Office](#)
 - [US Patent and Trademark Office](#)
 - [World Intellectual Property Organisation](#)
- The UK IPO includes facilities to search for
 - Trademarks (inc. logos), designs & patents

Export Control

What Are Export Controls?

- Export controls aim to restrict the transfer of sensitive materials outside of the UK e.g.
 - Goods
 - Technology
 - Software
- This includes both physical and electronic transfers e.g. emails, file transfers
- Can also include verbal transfer
- They apply to trade and commerce as well as research & teaching

What Are Export Controls?

- Export controls mainly come from the UK's observation of international conventions and treaties e.g.
 - UN Security Council Resolution 1540 – preventing terrorist access to WMDs
 - Chemical Weapons Convention
 - Wassenaar Arrangement – exchanging information on the sale of weapons to “states of concern”
- They are designed to preserve both national and international security e.g., the proliferation of WMDs
- Can also be designed to preserve fundamental human rights including, e.g., torture, repression & capital punishment

How Do Export Controls Work?

- The UK defines lists of goods, software and technology which are subject to export control
- When a good or service falls under one or more such controls an export license may be required
 - Administered by the Department for International Trade
- Depending on the nature of the goods or services such licenses can take several months to grant
- The time frame and its uncertainty can have a significant impact on business operations e.g.
 - Delay in delivery of goods and therefore payment
 - Of course, a license may not be granted

UK Strategic Export Control Lists

- These lists represent the starting point of determining whether a product, software or technology is controlled



- If interested you can find the list [here](#)
 - Note this is a document with >300 pages
 - This is itself a summary of any related legislation!

UK Strategic Export Control Lists

- There are several “lists” summarized in the previous document, including the
 - UK military list
 - UK Dual-Use list
 - Non-military firearms list
 - Human rights lists e.g. items related to torture and capital punishment
 - UK radioactive source list e.g. certain radionuclides and activity levels
- We aren’t going to go through these in great detail, but we’ll give a few examples

UK Military List

- Includes military goods, software and technology e.g.
 - Weapons & ammunition of various calibres
 - Bombs, torpedoes, rockets, missiles & explosives
 - Fire control, sights etc.
 - Vehicles e.g. tanks, aircraft, ships etc.
 - Chemical agents e.g. biological or radioactive materials
 - Some spacecraft systems
 - Forgings, castings or unfinished military goods
 - Directed energy weapon systems e.g. lasers, particle beams
 - Software inc. for the development, production of these items

UK Dual-Use List

- Dual-use goods, software and technologies are those that can find both military and civilian uses e.g.
 - Explosive-related goods and technology e.g. jamming equipment, shields & helmets, detonators etc.
 - Some telecommunications equipment
 - Chemicals & micro-organisms e.g. explosives, vaccines
 - Aircraft and lighter than air vehicles
 - Etc.
- This includes civilian items which with modification could find a military use

UK Dual-Use List

- Annex I of the dual-use list is a further definition of dual-use items under control
- It's much more specific and covers e.g.
 - Materials processing e.g. some bearings, test equipment
 - Electronics e.g. types of integrated circuits, optical circuits
 - Computers e.g. radiation hardened,
 - Telecoms e.g. radiation hardened, certain bands
 - Sensors & lasers e.g. cameras, optical sensors, radar
 - Navigation & avionics e.g. accelerometers, inertial measurement systems etc.
 - Marine e.g. submersibles, manned, unmanned etc.
 - Aerospace & propulsion e.g. rockets,

UK Dual-Use List

- Often it's not only a specific item or class or item but also equipment, software and technology necessary to design, test and manufacture that item
- The list can be fairly specific e.g.

Hybrid rocket propulsion systems having any of the following:

N.B. SEE ALSO 9A109 AND 9A119.

- a. Total impulse capacity exceeding 1.1 MNs; or
- b. Thrust levels exceeding 220 kN in vacuum exit conditions.

"UAVs" or unmanned "airships", designed to have controlled flight out of the direct 'natural vision' of the 'operator' and having any of the following:

1. Having all of the following:
 - a. A maximum 'endurance' greater than or equal to 30 minutes but less than 1 hour; and
 - b. Designed to take-off and have stable controlled flight in wind gusts equal to or exceeding 46.3 km/h (25 knots); or
2. A maximum 'endurance' of 1 hour or greater;

Penalties

- Breaching export control is a criminal offence
- Penalties can vary depending on the nature of the offence
 - Revocation of a license
 - Seizure of goods – 202 instances in 2021
 - Fines – total £225k in 2021
 - Up to 10 years imprisonment!
- As you can see the penalties can be significant and represent a significant risk
 - To a business
 - But also personal risk

Overview

- The lists refer to 1000s of items and their general descriptions
- We can't, therefore, consider them all here nor do we intend to
- Hopefully the types of items that can be subject to control are now aware to you
- The fact that some of these are perhaps surprising in nature will make you carefully consider export control

US Export Control

- We can't talk about export control without saying something about US export control
 - Covered by the Export Administration Regulations ([EAR](#))
 - They have similar lists to those in the UK
- This can have massive implications for UK businesses
- Items exported from the US to the UK may have limited use due to the EAR
 - E.g. a component is fine to export to the UK but then used in a system – this system may then be subject to control

