

SESA6085 – Advanced Aerospace Engineering Management

Lecture 19

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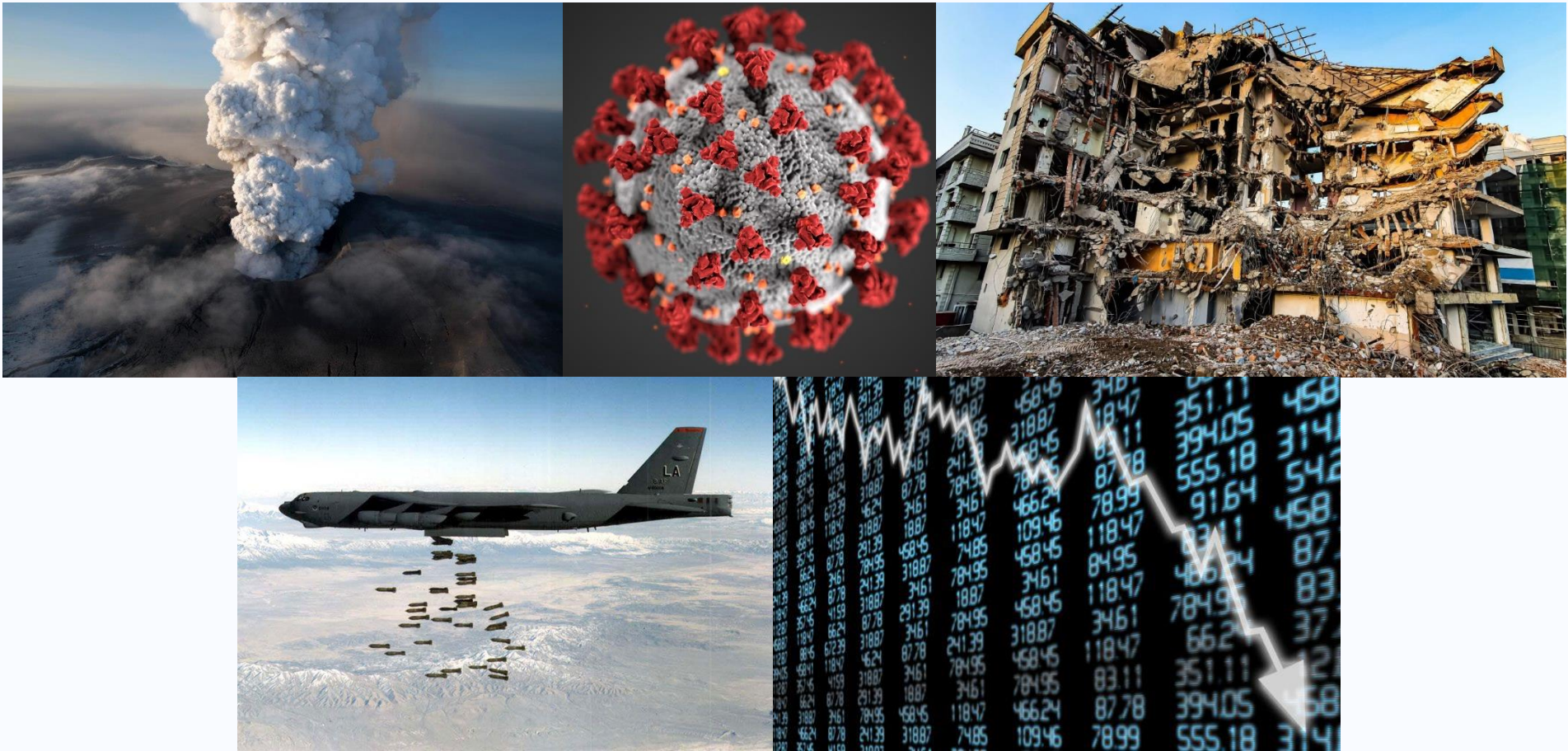
Module Recap

- Probability theory
 - Capturing uncertainty e.g. PDFs
 - The impact of uncertainty e.g. MC, RBD, FTA
 - Design in the presence of uncertainty
 - Project uncertainty management
 - Scheduling & supply
-
- We will now consider the top level of a business and how plans can be laid to guard the business against uncertain events



Moving up the
business

Uncertain Events



Business Continuity Management

Business Continuity Management?

- What is business continuity management (BCM)?
- BS25999 – the British Standard for Business Continuity Management states that BCM is...

“A holistic management process that identifies potential threats to an organization and the impacts to business operations that those threats, if realized, might cause, and which provides a framework for building organizational resilience with the capability for an effective response that safeguards the interests of its key stakeholders, reputation, brand and value-creating activities”

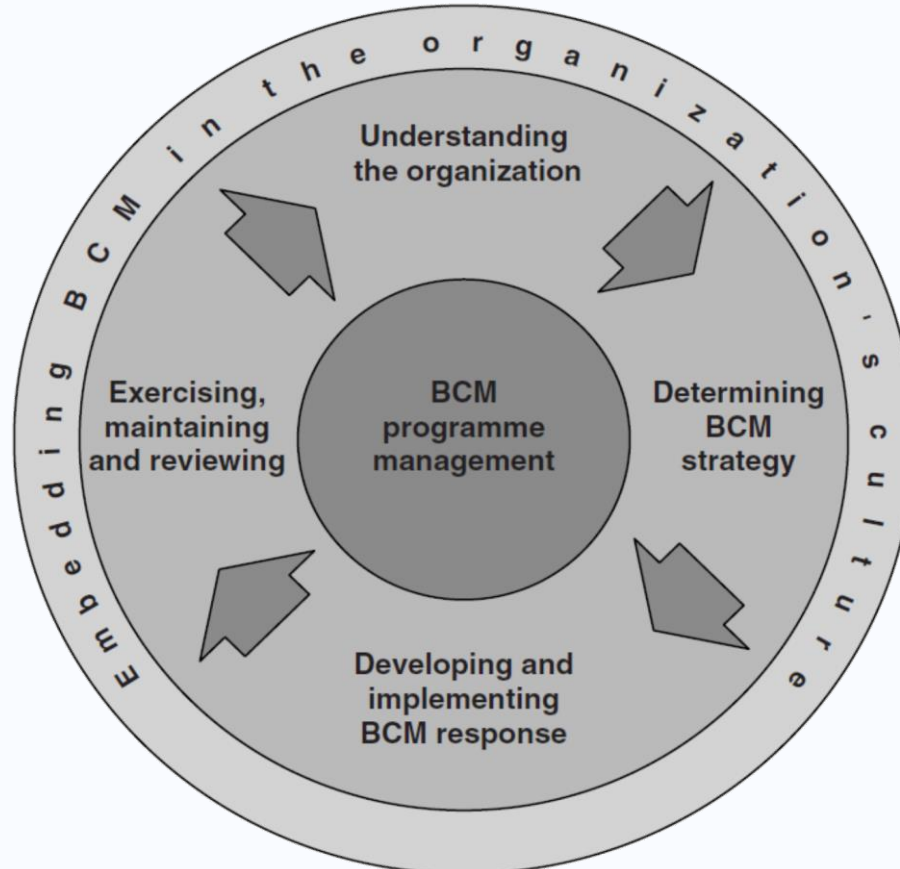
- We will use BS25999 in our definition of the BCM methodology

Business Continuity Management

- To summarise BCM is the critical information that a business needs to operate in an unplanned event
 - Environmental
 - Economical
 - Political
 - Virtual etc.
- It can also be regarded as a form of risk management

The BCM Lifecycle

- The BCM lifecycle comprises of several key activities illustrated using the following diagram



The BCM Lifecycle

- BCM Programme Management
 - Assign responsibilities, implement business continuity & provide ongoing management
- Understanding the organisation
 - Identification of objectives, stakeholder obligations, activities, assets & resources, impact of stoppage, threats & dependencies
 - Prioritisation of an organisation's products and the urgency of the activities required to deliver them
- Determining business continuity strategy
 - Identifies, evaluates and selects the most appropriate strategies for recovery

The BCM Lifecycle

- Developing & implementing a BCM response
 - Plans and arrangements made to manage any incident
- Exercising, Maintaining & Reviewing Arrangements
 - Ensuring arrangements remain effective thereby providing assurance of recovery and identifying areas for improvement
- Embedding BCM in the organisations culture
 - To be effective it must be embedded within routine operations and processes and not just written down and left on a shelf

BCM Stages

- Key stages of a BCM programme include:
 - Programme initiation
 - Awareness workshop
 - Business impact analysis
 - Risk assessment
 - Strategy development
 - Plan Writing - Inc. emergency response, incident management, recovery
 - Plan walk-through – validation of plan & training material
 - BCM programme completion – never completed rather a continual validation identifies gaps

Programme Initiation

- This includes the clarification of:
 - The scope, objectives, method, timing & schedule of the BCM process about to be undertaken
 - Fit within the organisation's mission, aims and objectives
 - Criteria to determine the criticality of business activities
 - Most likely causes of major incidents and types of impact
 - Stakeholders most impacted by business disruption

Awareness Workshop

- This workshop aims to get everyone involved to a basic level of understanding of BCM concepts

Business Impact Analysis

- This involves the determination of recovery priorities & objectives
- This process is based upon an assessment of the impacts over time that would result from stopping business activities
- The key steps include:
 1. Identifying the activities that support key products & services
 2. Assessing the impact over time from stopping each activity
 3. For each define a maximum tolerable period of disruption (MTPD)

Business Impact Analysis

- The steps continued...
 4. With the MTPD defined identify
 - The maximum period after disruption commences within which the activity must be resumed
 - The minimum level the activity needs to be at upon resumption
 - The length of time within which normal activity levels need to be resumed
 5. Categorise activities according to the priority for recovery
 - Identify any critical activities
 6. Identify dependencies to these critical activities
 - E.g. suppliers, partners and other stakeholders

Business Impact Analysis

- The MTPD is an important definition
 - How long would it take for an organisation to become unviable due to not performing a particular activity?
- The previously defined steps require a significant amount of information to be captured
 - Basic questionnaires can help with this process
 - However, it can take some time to collate and digest the necessary information

Risk Assessment

- Risk assessment techniques should be used to evaluate threats to critical activities
 - Identification of threats, vulnerabilities and impacts
- From the risk assessment a set of mitigation measures should be identified that
 - Reduce the likelihood of disruption
 - Shorten the period of disruption
 - Limit the impact of disruption

Assessing Risk

- Assessing risk is a key component of developing a business continuity plan
- However, we can run into a number of problems trying to do this
 - We're responsible for managing risks but they are rarely under our control
 - Statistics on catastrophic events are difficult to apply to a single location and/or type of business
 - Unlikely but severe events rarely affect our decisions but they could be disastrous for our business
- We're now going to consider a systematic manner to assess these types of risk

Objective of Risk Evaluation

- We are aiming to determine the events that can adversely impact an organisation and the damage caused
- Then use this to develop controls to cost-effectively reduce the probability or impact of an event
 - Recall our classic health and safety risk assessment
- There are five stages associated with these objectives
 1. Understand the loss potential and vulnerability to such losses
 2. Evaluate risk analysis tools & techniques
 3. Define a risk evaluation strategy
 4. Select a process to evaluate risk
 5. Establish risk avoidance measures to prevent or minimise the effect

Risk Evaluation

- There are four key steps to operational risk evaluation
 1. Asset & threat identification
 - Listing and categorisation of corporate assets
 - Consider areas of risk including:
 - Policies & procedures
 - Manufacturing processes
 - Physical access security
 - Computer systems & networks
 - Recruitment
 - Communications
 - Assessment of these risks and their relationship to key assets

Risk Evaluation

2. Quantification of potential losses

- Accounts
- Marketing assessment of finding new customers or the impact on reputation
- Stock market valuation
- Using recent events in the sector
- Potentially canvassing outside opinions

Risk Evaluation

3. Assessment of vulnerabilities

- Use of historical data
- Subjective estimates e.g. elicitation
- Conduct simulations
- Calculate Risk = Impact \times Probability and use this to rank risks
 - Note we are at a high level here where decomposition as suggested in a PUMP approach may not always be possible

Risk Evaluation

4. Evaluation of solutions

- Accept the risk
 - Rare event and unlikely to impact business – reasonable to accept the risk e.g. current government policy which is outside of our control
- Manage the risk
 - Frequent low-impact risk – monitor and seek to reduce the risk
- Reduce the risk
 - Frequent potentially damaging event – requires risk reduction measures
- Plan
 - Rare but high impact (business failure) – use of business continuity planning

Strategy Development

- This stage involves the development of strategies for recovering critical activities
- Also including any support services that these activities require e.g. IT, communications infrastructure, buildings etc.
- Usually this involves the holding of a series of workshops to identify options for recovery from a major incident
- Workshop representatives should be from managers and staff across all departments linked to critical activities and their support
- The feasibility of any options should be assessed e.g. cost

Potential Disasters



Disaster Statistics

- Statistics on past “disasters” can be quite illuminating as to the potential probability of such a disaster happening to an organisation
 - Of course the term “disaster” is ambiguous, what’s a disaster to a small local business in terms of a loss might be an afternoons trading for one person in an investment bank
- London School of Business noted...
 - 57% of business disasters are IT-related
 - 35% of firms suffering such a disaster lost over £250k
- SunGard (an IT disaster recovery business) noted...
 - 30% of disasters are caused by fraud, malice or misuse
 - 20% by fire, flood or storm
 - 2-5% relate to terrorism



Natural Disasters

- This includes, floods, hurricanes, storms, mudslides, volcanos, earthquakes etc.
 - 1980 – 2005 the US sustained 67 weather-related disasters where overall damage exceeded \$1 billion
 - 2005 - Hurricane Katrina resulted in \$45b in insured losses

Terrorism

- This includes bomb attacks, shootings, sabotage, kidnappings
 - In 2008, 11,800 terrorist attacks occurred resulting in 54,000 deaths, injuries & kidnappings



Man-made Disasters

- With the exception of war man-made disasters can't quite emulate the impact of a natural disaster, but some come close
 - 1984 – Bhopal, India – an explosion and contamination resulted in the world's worst industrial accident with 15,000 deaths & 500,000 exposed to methyl isocyanate gas
 - 1986 – Chernobyl – 335,000 evacuated & 9,000 deaths
 - 2002 – Lagos, Nigeria, 1100 deaths in an armoury explosion



Lessons Learned

- Reviewing existing disasters not only gives an idea of their potential likelihood but also the issues faced by those involved can highlight important lessons for future BCM plans
 - As already note BCM is a continual iterative process
 - Disasters happening elsewhere can and should feed into the review of our own BCM plans
- “The definitive handbook of business continuity management” by A. Hiles (2010) provides 31 different disaster case studies which can be used to inform a BCM
 - Hurricanes, storms, volcanos
 - Explosions, fires, bombings etc.
- We will now consider one of these case studies



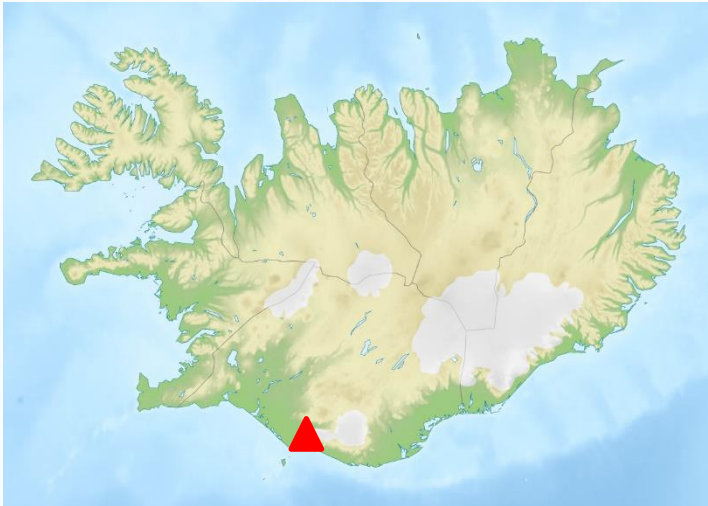
Case Study

The Icelandic Volcanic Ash Plume – April
2010



Background

- On 13th April a vent opened on the Eyjafjallajokull volcano in southern Iceland



- Resulting in a column of ash several kilometres high and glacial floods in the vicinity of the volcano



Background

- The silica-based ash from a volcano can have a serious impact on aircraft
 - Engines can clog causing a flameout
 - Windscreens can be scoured making them opaque
- 1982 a British Airways flight to Australia flew through such a cloud from an Indonesian volcano
 - Power from all 4 engines was lost (but regained)
 - Landing was difficult as the windscreen was completely opaque



The Impact

- The Icelandic eruption spread ash across all of Europe closing airports from London to Ukraine
- Airlines in the rest of the world were forced to delay/cancel flights to Europe
- Aircraft and crew were left stranded
- Transfers for long-haul flights were disrupted
- On 16th April only 10,400 of the usual 28,000 flights took off
- On 17th April only 6,000 of 22,000 took off
- Military bases were shut down over Europe



The Impact

- The impact was felt beyond the aviation sector
 - Major events were impacted including the London Marathon which went ahead without overseas participants
- Passengers were stranded overseas
 - Emirates had 40,000 passengers in one terminal at one point
- Airlines inc. BA, Lufthansa, KLM & Ryanair ran test flights to see if they could navigate the ash cloud
 - Leading to arguments as to when it was safe to reopen airspace
- The Royal Navy was deployed to repatriate UK nationals



The Losers

- Overall a significant number of people were directly impacted by this event
 - Airlines – lost an estimated \$200m per day
 - Airline shareholders e.g. BA shares fell 3.3%
 - Airline employees – temporary redundancies
 - Airline suppliers – fuel, catering, airports etc.
 - Logistics companies – deliveries significantly delayed
 - Airline customers – holidaymakers, business people
 - Holiday resorts
 - Gardeners & florists – rely on stock being flown
 - Health sector – drug delivery & absence of staff & patients



The Winners

- For some this was actually an opportunity
 - Spain & Portugal – airspace largely remained open
 - Hotels close to airports
 - Ferry operators
 - Eurostar and train operators
 - Taxi firms – long-distance taxi rides
 - Car washes – to clean the dust settling



Lessons Learned

- In geophysical terms this was a relatively small eruption
 - Airspace was closed for a few days
- Larger bigger eruptions could potentially happen and have bigger consequences
- This was not an isolated event so airlines and regulators have collaborated on new processes and procedures
- These bare the hallmarks of the type of BCM we've discussed
 - The development of on-board ash measuring devices
 - Research on modelling ash in the atmosphere
 - Contingency plans tested using simulated volcanic ash events
 - Contingency plans for ash but also toxic gas & lava
 - Exercises designed to improve coordination between stakeholders

