

## Coordinator Notes: Module 1.1 Air & Flight – Aerodynamics

This Module explores the science behind air and flight!

- Students will build knowledge about: air, aerodynamics and the forces of flight.
- Students will utilise this knowledge in a Paper Plane Challenge.

### **Session Length:**

This Module can be presented in different session durations per your needs.

Lesson plans are provided for:

- A 120 minute session, or, 2 x 60 minute sessions
- 45 minute, 75 minute, and 90 minute sessions

### **Technology:**

**PowerPoint:** If you do not have access to a data projector and cannot display the PowerPoint presentation, we recommend that you print the most important slides before the session, and either enlarge them onto cardboard to use in place of slides, or create a booklet that students can share in small groups.

The most important slides have been included as a 'Reduced Slides' PowerPoint file, and an easily printable pdf version of these slides is also provided. If you choose this option, we recommend that you still read and use the slide notes included in the full PowerPoint for the session.

The session can be conducted without slides all together, but they offer visual aid in explanation of scientific concepts. We recommend at the very least that instructions for each experiment are printed for the students.

**Videos links:** The suggested links to online videos within the session can be helpful with explanation. Notes have been included in the slides if there is an essential component to a video which the facilitator should discuss or demonstrate, if the video cannot be played.

**Video files:** A video file for each Module has been provided to aid explanation and instruction for some experiments and challenges. It is recommended coordinators view video files prior to delivering sessions, if the experiments and challenge activities are unfamiliar.

**\*Please read the Module 1 Risk Assessment before proceeding with the session\***

<b>Contents</b>	<b>Page</b>
Module 1.1 Overview	3
Lesson Plan for Module 1.1 - 120 minute session, or, 2 x 60 minute sessions	5
Experiment E1.1.1: Paper Lift	7
Experiment E1.1.2: Moving Flame	8
Experiment E1.1.3: Aerodynamic Test	9
Challenge M1.1 – Paper Aeroplane Challenge – Coordinator Notes	10
Challenge M1.1 – Paper Aeroplane Challenge – Score Sheet	12
Lesson Plan for Module 1.1 - 90 minute session	14
Lesson Plan for Module 1.1 - 75 minute session	16
Lesson Plan for Module 1.1 - 45 minute session	17
References	18
Materials Required for Module 1.1 sessions	19

## Module 1.1 AIR & FLIGHT – Aerodynamics: Overview

This Module is the first science club session!

Each suggested lesson plan includes time at the start of the session for a **welcome and introduction** activity. This can be as simple as encouraging participants to meet two new people in the room, or extend into an ice-breaker activity of the facilitators choosing.

Begin the session by **exploring AIR** with the group, encouraging students to share what they already know, notice and wonder.

### Content overview:

Concept / Activity	Session Duration (minutes)			
	120	90	75	45
<b>The Scientific Method</b> Discuss with students the steps scientists use to learn about the world: observing, questioning, forming hypothesis, researching & experimenting, analysing, forming conclusions, communicating results.	*	*	*	*
<b>Experiment E1.1.2 Moving Flame</b> A quick experiment to reinforce the Scientific Method, observe how air movement affects a flame, and introduce the concept of air pressure.	*	-	-	-
<b>Aerodynamics</b> Introduce the concept of wind resistance, objects moving through air, and discuss aerodynamic shapes.	*	*	*	*
<b>Experiment E1.1.3 Aerodynamic Test</b> A quick experiment to reinforce the Scientific Method and explore aerodynamic shapes.	*	*	*	*
<b>Four Forces of Flight</b> Discuss the forces of flight, looking at how aeroplanes fly: Weight, Lift, Thrust, and Drag.	*	*	-	-
<b>Newton's 3<sup>rd</sup> Law of Motion</b> Introduce and discuss Newton's Laws. Explore Newton's 3 <sup>rd</sup> law: every action has an equal and opposite reaction.	*	*	-	-
<b>Lift</b> Explore how the force of lift works to assist planes to fly.	*	*	-	-
<b>Experiment E1.1.1 Paper Lift</b> A quick experiment to reinforce the Scientific Method, observe how air movement can generate lift.	*	*	-	-
<b>Birds, Planes and Rockets</b> Explore the similarities and differences in shapes / features of three flying objects.	*	*	*	-
<b>Paper Aeroplane Challenge</b> Explore paper aeroplane building. Which designs stay in the air for the longest time? Which designs fly the furthest?	*	*	*	*

**Slides:**

PowerPoint Slides are available to support the delivery of this module. Slides explain concepts visually, and include short, engaging videos relevant to the topic.

A full list of slides and recommended inclusions for each session duration are provided in the table below. Appropriate slides are also noted in lesson plans for each duration.

<b>PowerPoint Presentation: 'M 1.1 - Master Slides 120 minute Session Duration'</b>		<b>Session Duration (minutes)</b>			
<b>Slide</b>	<b>Content</b>	<b>120</b>	<b>90</b>	<b>75</b>	<b>45</b>
<b>1</b>	Introductory title page for Module 1.1	*	*	*	*
<b>2</b>	Welcome, prompt for ice-breaker activity	*	*	*	*
<b>3</b>	Prompt for group discussion about the topic of AIR	*	*	*	*
<b>4</b>	Introduces the Scientific Method	*	*	*	*
<b>5</b>	Outlines Experiment 1.1.2 'Moving Flame'	*	-	-	-
<b>6</b>	Prompt for group discussion about wind resistance	*	*	*	-
<b>7</b>	Introduces concept of AERODYNAMIC shapes	*	*	*	-
<b>8</b>	Outlines Experiment 1.1.3 'Aerodynamic Test'	*	*	*	*
<b>9</b>	Introduces the four forces of flight	*	*	-	-
<b>10</b>	Introduces Newton's 3 <sup>rd</sup> Law of Motion	*	*	-	-
<b>11</b>	Outlines the concept of 'lift' force	*	*	-	-
<b>12</b>	Outlines Experiment 1.1.1 'Paper Lift'	*	*	-	-
<b>13</b>	Prompt for discussion about aerodynamics of flying objects	*	*	*	-
<b>14</b>	Introductory title page for Challenge 1.1	*	*	*	*
<b>15</b>	Introduces Challenge 1.1: 'Paper Aeroplane Challenge'	*	*	*	*
<b>16</b>	Video link to Paper Airplane World Championship 2015	*	-	-	-
<b>17</b>	Outlines Paper Plane Guinness World Records	*	*	*	*
<b>18</b>	Rules for Challenge 1.1: 'Paper Aeroplane Challenge'	*	*	*	*
<b>19-26</b>	Images of Paper Plane designs to prompt construction	*	*	*	*
<b>27</b>	Session references, online links	*	*	*	*
<b>28</b>	Replacement Slide for 45 minute session, combines Slides 6 & 7	-	-	-	*

<p align="center"><b>Module 1.1 AIR &amp; FLIGHT – Aerodynamics: Lesson Plan</b></p> <p align="center"><b>120 minute session or 2 x 60 minute sessions</b></p>			
<p><b>High Tech:</b> Use PowerPoint Presentation 'M 1.1 - Master Slides 120 minute Session Duration'</p> <p><b>Low Tech:</b> Print PowerPoint 'M 1.1 - Reduced Slides for Printing'. Use slide notes from the ENTIRE 120 minute presentation, adapting discussion to cover omitted slides.</p>			
<p><b>Key Learning Area</b> Physics</p>			<p><b>Topic</b> Aerodynamics</p>
Timing	Running Time (hh:mm)	Procedure	Materials
5 min	00:05	<p><b>Lesson Introduction</b></p> <p>Welcome &amp; ice-breaker activity</p>	PowerPoint M 1.1 (slides 1-3)
5 min	00:10	<p><b>Body of Lesson (Lesson 1, 2 x 60 minute sessions)</b></p> <p>The scientific method</p>	PowerPoint M 1.1 (slide 4)
5 min	00:15	Discuss hypothesis and conduct E1.1.2 Moving Flame experiment, discuss results	PowerPoint M 1.1 (slide 5), Tall candles, matches, A4 paper
2 min	00:17	Aerodynamics	PowerPoint M 1.1 (slides 6-7)
10 min	00:27	Discuss hypothesis and conduct E1.1.3 Aerodynamic Test experiment, discuss results	PowerPoint M 1.1 (slide 8), A4 paper
10 min	00:37	Four forces of flight	PowerPoint M 1.1 (slides 9-11)
5 min	00:42	Discuss hypothesis and conduct E1.1.1 Paper Lift experiment, discuss results	PowerPoint M 1.1 (slide 12), A4 paper
5 min	00:47	Aerodynamic shapes of flight	PowerPoint M 1.1 (slide 13)
10 min	00:57 / 1 HOUR	<p>Introduce challenge, watch Paper Plane world championship video</p> <p><b>(Break for 2 x 60 minute sessions)</b></p>	PowerPoint M 1.1 (slides 14-16)

		<b>Body of Lesson (Lesson 2, 2 x 60 minute sessions)</b>	
<b>5 min</b>	00:05/ 01:05	World Records and challenge rules	PowerPoint M 1.1 (slides 17-26)
<b>10 min</b>	00:15/ 01:15	Design and trial paper planes	A4 paper, scissors, rulers, paper clips
<b>10 min</b>	00:25/ 01:25	Decide on and construct final design	
<b>15 min</b>	00:40/ 01:40	Undertake Testing	Measuring tape, stopwatch, Score Sheet M 1.1
<b>5 min</b>	00:45/ 01:45	Clean up	
		<b>Lesson Conclusion</b>	
<b>5 min</b>	00:50/ 01:50 END.	Announce scores and winning plane. Discuss good characteristics of planes.	

## Module 1.1 – Aerodynamics Experiments

### E1.1.1: Paper Lift

**Aim:** To observe how air movement can affect a piece of paper

**Equipment:**

- A4 paper (1 sheet per student)

**Procedure:**

1. Collect a piece of A4 paper.
2. Hold the short edge of the paper just under your bottom lip with the long end hanging down in front of your chest.
3. Take a big breath
4. Blow as hard as you can out of your mouth.
5. Observe the effect on the paper

Extension: observe how the effect changes if you blow harder or softer.

**Expected Result:**

The bottom end of the paper should rise up when you blow out. This requires quite a hard blow to occur.

**Explanation:**

The air that travels over the top over the top of the paper is dragged downwards rapidly once it reaches the end of the paper by the Coanda effect. (This is a phenomenon whereby moving fluids stick to surfaces they are moving past – this can easily be demonstrated with tap water and a spoon – notice how as you put the spoon on the edge of the water it appears that the water ‘bends’ towards the spoon as the water sticks to it)

The air has been dragged downwards over the top of the paper, and an equal and opposite reaction acts upon the paper and pushes the paper up, according to Newtons 3<sup>rd</sup> law!

This is the same concept as the wings on an aeroplane generating lift force as they move through the air (see “how does lift work” diagram in slides).

**\*\*Note:** This experiment is included in the Module 1.1 Video\*\*

### **E1.1.2: Moving Flame**

**Aim:** To observe how air movement can affect a flame.

**Equipment:**

- A4 paper - 1 sheet per group
- Candle (pillar candles are best) – 1 per group
- Matches to light candles (3 per group)

**Procedure:**

1. Form into groups of 3 to 4 students.

In groups:

2. Collect a candle, paper and matches.
3. Place the candle on a table and light it.
4. Gripping a piece of A4 paper at the two short ends, hold it beside and about twice the height of the candle.
5. Pull the paper abruptly downwards next to the candle.
6. Observe the effect on the flame. Document your observations!

**Expected Result:**

The flame of the candle will move toward the side where the piece of paper was moved.

**Explanation:**

This is a quick demonstration of the effects of movement of air and changing air pressure. The flame moves toward the paper due to the air underneath the paper moving at a high speed resulting in low air pressure. That means one side of the candle will have a region of low pressure (which you created by moving the paper) and one side will have a region of high pressure. As things equilibrate (go back to normal) the high pressure air moves toward the low pressure air. That means there will be air moving toward the side of the paper and so the flame will be bent toward the side of the paper.

**\*\*Note: This experiment is included in the Module 1.1 Video\*\***



### **E1.1.3: Aerodynamic Test**

**Aim:** To observe the effect of aerodynamic shapes.

**Equipment:**

- A4 paper – 2 sheets per student

**Procedure:**

1. Fold one piece of A4 paper into a paper plane using the instructions provided.
2. Throw both the unfolded and folded pieces of paper.
3. Observe how both objects travel through the air. Document your observations!
4. Discuss your ideas on why the unfolded and folded paper behaved differently.

**Expected Result:**

The paper plane follows a clear path and stays in the air longer. The unfolded paper flutters in the air at random and falls to the ground quickly.

**Explanation:**

The paper plane has an aerodynamic shape. It has wings and a pointed nose so it can cut through the air well and has lift from the wings.

The unfolded paper is not an aerodynamic shape. It lacks wings and a pointed nose to direct it through the air.

## Challenge M 1.1 – Paper Aeroplane Challenge

### Coordinator Notes

#### Scoring:

A scoring mechanism is included, so the element of ‘competition’ may challenge all students to participate to their fullest. You may remove the scoring system all together if it does not work with your group of students.

When scoring it is important to only announce who the winning team/plane is - so there will be no ‘losers’ or last place.

It is important to highlight the good strategies of each team so all feel like they have done a good job.

Consider asking students how they might approach the task differently if asked to do it again, or how they might teach the same things they learned during the club to a younger student.

**\*\* If you choose not to use a scoring system modify the slides that reference a ‘score’\*\***

#### Activity Tips:

- This challenge is best undertaken inside (unless it is a very calm and still day). A long corridor or large room works best.
- Computers and internet access are useful to have during this session. There are many great sites on which the students can find designs and instructions. There are also some designs supplied. Useful sites:  
<http://www.foldnfly.com>  
[http://www.funpaperairplanes.com/plane\\_downloads-eu.html](http://www.funpaperairplanes.com/plane_downloads-eu.html)  
<http://www.origami-kids.com/>
- Paper clips can be used to weight the planes if they are unbalanced, but do not have to be used.
- At the end of the competition, leave a few minutes to talk about the different designs that were made and what features the most successful planes had.
- Students may like to work individually, or in groups of 2 to 4.
- During testing, encourage students to watch, support and cheer for each plane thrower.
- Groups may choose to take turns throwing across the three throw attempts.
- Support students to perform the official measuring and timing, and to help record results.
- Compare student results back to the world records!

**Suggested rules / guidelines:**

- Paper planes should be made out of a single piece of A4 paper only (it may be cut with scissors).
- Paper clips may be used as weights if desired.
- Paper plane thrower must stand behind starting line.
- Distance measurement will be taken from starting line to nose of the plane when landed.
- Time aloft measurement is timed from the moment the plane leaves the throwers hand to the moment any part of the plane touches the ground or another object.
- Thrower is given a maximum of three attempts. The best attempt will be taken as the score.
- Participants can construct a single plane OR two separate planes. A maximum of two planes will be used in testing for each participant / group.
- Final point score will be the best distance plus the best time, for each participant / group.

**45 minute session adjustment:**

- For a 45 minute session, it may be practical to allow groups only one throw, with one plane only (at coordinator's discretion e.g.. if a participant's first attempt is affected by something you may want to offer another).
- If time permits, give participants a second and or third throw (this is ideal).

**Notes on Lift:** The wings of a paper plane are able to generate lift!

As the air moves over the top of the wing, it is dragged downwards by the 'Coanda effect'. This is a phenomenon whereby moving fluids stick to surfaces they are moving past. This causes the air to be pulled downwards rapidly along the curve of the wing.

Since the plane has pushed air down, the plane itself gets pushed up (this is according to Newton's third law).

This is how the wings generate lift.

In order to actually lift, a LOT of air needs to be moved downwards - which is why wings need to be very carefully designed.

It's also why they're angled up – in order to push the air in a more directly downwards direction.

### Score Sheet: M 1.1 Paper Aeroplane Challenge

**Note:** Put an asterisk beside the best distance and best time. When calculating the final score, add the two numbers with the asterisks beside them.

Team, Plane or Individual Name	Distance	Time	Score

Team, Plane or Individual Name	Distance	Time	Score

<b>Module 1.1 AIR &amp; FLIGHT – Aerodynamics: Lesson Plan</b>			
<b>90 minute session</b>			
<p><b>High Tech:</b> Adapt 'M 1.1 - Master Slides 120 minute Session Duration'. Hide slides 5, 16 and 28. Alternately, this option has been provided for you as PowerPoint 'M 1.1b – 90 minute session full slides'.</p> <p><b>Low Tech:</b> Print PowerPoint 'M 1.1b – 90 minute Reduced Slides'. Use slide notes from the ENTIRE 90 minute presentation, adapting discussion to cover omitted slides.</p>			
<b>Key Learning Area</b> Physics		<b>Topic</b> Aerodynamics	
Timing	Running Time (hh:mm)	Procedure	Materials
<b>5 min</b>	00:05	<b>Lesson Introduction</b> Welcome & ice-breaker activity	PowerPoint M1.1b (slides 1-3)
<b>2 min</b>	00:07	<b>Body of Lesson</b> Aerodynamics	PowerPoint M1.1b (slides 4-5)
<b>3 min</b>	00:10	The scientific method	PowerPoint M1.1b (slide 6)
<b>10 min</b>	00:20	Discuss hypothesis and conduct E1.1.3 Aerodynamic Test experiment, discuss results	PowerPoint M1.1b (slide 7), A4 paper
<b>10 min</b>	00:30	Four forces of flight	PowerPoint M1.1b (slides 8-10)
<b>5 min</b>	00:35	Discuss hypothesis and conduct E1.1.1 Paper Lift experiment, discuss results	PowerPoint M1.1b (slide 11), A4 paper
<b>5 min</b>	00:40	Aerodynamic shapes of flight	PowerPoint M1.1b (slide 12)
<b>5 min</b>	00:45	Introduce challenge, rules and World Records	PowerPoint M1.1b (slides 13-24)
<b>10 min</b>	00:55	Design and trial paper planes	A4 paper, scissors, rulers, paper clips
<b>10 min</b>	01:05	Decide on and construct final design	

<b>15 min</b>	01:20	Undertake Testing	Measuring tape, stopwatch, Score Sheet M1.1
<b>5 min</b>	01:25	Clean up	
<b>5 min</b>	01:30 END.	<b>Lesson Conclusion</b>  Announce scores and winning plane. Discuss good characteristics of planes.	

<b>Module 1.1 AIR &amp; FLIGHT – Aerodynamics: Lesson Plan</b>			
<b>75 minute session</b>			
<p><b>High Tech:</b> Adapt 'M 1.1 - Master Slides 120 minute Session Duration'. Hide slides 5, 9, 10, 11, 12, 16 and 28. Alternately, this option has been provided for you as PowerPoint 'M 1.1c – 75 minute session Full Slides'.</p> <p><b>Low Tech:</b> Print PowerPoint 'M 1.1c – 75 minute Reduced Slides'. Use slide notes from the ENTIRE 75 minute presentation, adapting discussion to cover omitted slides.</p>			
<b>Key Learning Area</b> Physics		<b>Topic</b> Aerodynamics	
Timing	Running Time (hh:mm)	Procedure	Materials
<b>5 min</b>	00:05	<b>Lesson Introduction</b> Welcome & ice-breaker activity	PowerPoint M1.1c (slides 1-3)
<b>2 min</b>	00:07	<b>Body of Lesson</b> Aerodynamics	PowerPoint M1.1c (slides 4-5)
<b>3 min</b>	00:10	The scientific method	PowerPoint M1.1c (slide 6)
<b>10 min</b>	00:20	Discuss hypothesis, demonstrate experiment E1.1.3 Aerodynamic Test, discuss results	PowerPoint M1.1c (slide 7), 2 sheets of A4 paper (one pre-folded into a paper aeroplane)
<b>2 min</b>	00:22	Common Shapes	PowerPoint M1.1c (slide 8)
<b>5 min</b>	00:27	Introduce challenge and rules	PowerPoint M1.1c (slides 9-20), A4 paper, scissors, rulers, paper clips
<b>20 min</b>	00:47	Design and trial paper planes	
<b>20 min</b>	01:07	Undertake Testing	Measuring tape, stopwatch, Score Sheet M1.1
<b>5 min</b>	01:12 END.	<b>Lesson Conclusion</b> Clean up, announce scores and winning plane. Discuss good characteristics of planes.	

**Note:** If you have extra time, you may like to demonstrate experiment E1.1.1: Paper Lift



<b>Module 1.1 AIR &amp; FLIGHT – Aerodynamics: Lesson Plan</b>			
<b>45 minute session</b>			
<p><b>High Tech:</b> Adapt 'M 1.1 - Master Slides 120 minute Session Duration'. Hide slides 5, 6, 7, 9, 10, 11, 12, 13, and 16. Use slide 28 in place of slides 5 and 6. Alternately, this option has been provided for you as 'M1.1d - 45 minute Full Slides'</p> <p><b>Low Tech:</b> Print PowerPoint 'M 1.1d – 45 minute Reduced Slides'. Use slide notes from the ENTIRE 45 minute presentation, adapting discussion to cover omitted slides.</p>			
<b>Key Learning Area</b> Physics			<b>Topic</b> Aerodynamics
Timing	Running Time (hh:mm)	Procedure	Materials
<b>5 min</b>	00:05	<b>Lesson Introduction</b> Welcome & ice-breaker activity	PowerPoint M1.1d (slides 1-3)
<b>2 min</b>	00:07	<b>Body of Lesson</b> Aerodynamics	PowerPoint M1.1d (slide 4)
<b>3 min</b>	00:10	The scientific method	PowerPoint M1.1d (slide 5)
<b>5 min</b>	00:15	Discuss hypothesis, demonstrate experiment E1.1.3 Aerodynamic Test, discuss results	PowerPoint M1.1d (slide 6), 2 sheets of A4 paper (one pre-folded into a paper aeroplane)
<b>5 min</b>	00:20	Introduce challenge and rules	PowerPoint M1.1d (slides 7-17)
<b>10 min</b>	00:30	Design and trial paper planes	A4 paper, scissors, rulers, paper clips
<b>10 min</b>	00:40	Undertake Testing	Measuring tape, stopwatch, Score Sheet M1.1d
<b>5 min</b>	00:45 END.	<b>Lesson Conclusion</b> Clean up, announce scores and winning plane. Discuss good characteristics of planes.	

## Module 1.1 – References

### Scientific Method:

[http://www.sciencemadesimple.com/scientific\\_method.html](http://www.sciencemadesimple.com/scientific_method.html)

### Aerodynamics / Forces of Flight:

<http://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-is-aerodynamics-58.html>

<http://www.aviation-for-kids.com/Lift.html>

### Paper Aeroplane designs:

[http://www.funpaperairplanes.com/plane\\_downloads-eu.html](http://www.funpaperairplanes.com/plane_downloads-eu.html)

### Paper Wings Competition Video:

<https://www.youtube.com/watch?v=SUyqakRMrxo>

### Guinness World Records for Paper Aeroplanes:

<http://www.guinnessworldrecords.com/world-records/farthest-flight-by-a-paper-aircraft>

<http://www.guinnessworldrecords.com/world-records/longest-time-flying-a-paper-aircraft>

## Module 1.1 - Required Materials

- Pens, pencils and writing paper are generally required every session.
- Students may like to bring a note pad to record their observations and ideas.
- A group usually refers to 2 - 4 students.

Activity	Material	Amount	Where can I find it?
All sessions	PowerPoint Slides* (digital, or printed)	1 per coordinator	Coordinator Package
All sessions	Printed PowerPoint* Slide Notes	1 per coordinator	Coordinator Package
All sessions	Printed Lesson Plan	1 per coordinator	Coordinator Package
All sessions	Printed Module 1 Risk Assessment	1	Coordinator Package
All sessions	Computer, Data Projector, Screen	1	Venue
120 minute or 2 x 60 minute sessions  Experiments	A4 Paper	4 sheets per student	Supermarket / Stationary Shop
	Tall Candles	1 per group	Supermarket / Hardware Store
	Matches	3 per group	Supermarket / Hardware Store
90 minute session Experiments	A4 Paper	4 sheets per student	Supermarket / Stationary Shop
75 minute or 45 minute session Experiments	A4 Paper	2 sheets per student	Supermarket / Stationary Shop
Paper Aeroplane Challenge  (All Sessions)	A4 Paper	5 to 10 sheets per student	Supermarket / Stationary Shop
	Paper clips	5 per student	Supermarket / Newsagent Stationary Shop
	Rulers	1 per student	Supermarket / Newsagent / Stationary Shop
	Scissors	1 per group	Supermarket / Newsagent / Stationary Shop
	Stopwatch	2 or more	Sports store Note: Mobile phones often have a stop watch feature
	Measuring Tape (as long as practical)	1 or more	Supermarket / Hardware Store

\*Slide sets available:

- 120 minute session or 2x60 minute sessions: Slides 1.1a (M 1.1 Master Slides)
- 90 minute session: Slides 1.1b
- 75 minutes session: Slides 1.1c
- 45 minutes session: Slides 1.1d