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RADIO NAVIGATION

CHAPTER 17 – USEFUL UNDERDOWN REFERENCES

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INTRODUCTION

The Hong Kong CAD syllabus relies heavily on the R.B Underdown textbook 'Ground Studies for Pilots Volume 1 Radio Aids' as a source of reference for many syllabus items.

The table in the next section is provided as an aid to revision. It enables the student to cross reference syllabus material defined in the Underdown text with its corresponding chapter in the FTA ebook.

UNDERDOWN REFERENCES

FTA CHAPT	Item Covered	Underdown Page
1	100% amplitude modulation requires an increase in power of 50% to maintain the same range.	10
1	Comparison of AM and FM equipment and characteristics.	11
2	Attenuation is less with vertically polarised waves.	20
2	Range of frequencies which may refract from the F layer, VLF, LF & MF never. But HF from F_2 by day & combined F layer by night.	25
2	Factors affecting the maximum range of a single hop sky wave.	25
2	Radio static (noise) changes seasonally and diurnally.	31
2	Metric (VHF) and Centimetric (SHF) wavelengths.	33-34
2	Attenuation from water vapour starts at 1Ghz. Likewise attenuation from clouds, see page 139. It is actually 3 Ghz so neither is correct, but that is what you must know!	34
3	MUF>OWF. MUF is just short of the escape frequency. OWF is the highest frequency available on the radio which is < MUF.	37
3	Reflection (ie refraction) height for HF increases at night. (NB this is not always the case).	37
3	Satcom; note why it is virtually unaffected by met conditions or geographical location.	41
6	Frequency bands for ground stations equipped for D/F.	44
4	Locators are usually sited at outer or middle marker. The term Locator is specific to UK Radio Navigation Services.	52
4	NDB sky wave range is 70 to 100 nm. Night Effect is indicated to the pilot by excessive oscillation (wavering or hunting) of the ADF needle and fading of the signal.	65/66

FTA CHAPT	Item Covered	Underdown Page
4	Night Effect produces greatest errors at dawn and dusk.	66
4	Static interference caused by precipitation.	67
5	DOC for a VOR is applied 24 hours per day.	82
5	VOR Ident occurs at least once every 10 seconds.	84
5	Protection range and altitude. Also applies to VHF communications.	86/87
5	VOR Pilotage Error; one of the factors affecting accuracy.	88
5	VOR transmissions are “practically free from static”; this means they maybe affected by static interference but the effect will be small.	89
5	VOTs transmit radial 000 uniformly in all directions.	89
5	Answer to Q7 should be 080ºM.	100
7	ILS; operation of warning flags and impact on needles.	106
7	ILS Reference Datum – use 50 feet.	111
7	ILS Reference Point – on the runway surface.	112
7	Cat 1 RVR is 550 m.	113
7	Offset Localiser data and information.	113/114
8	MLS – principle of operation is TRSB. Sometimes only azimuth in the back beam. MLS includes DME (a precision DME) whereas ILS uses marker beacons.	117
7	Fan markers cannot be used as directional aids.	118
9	Characteristics which determine minimum and maximum range of primary radars.	123/124
9	See (7) – when circular polarisation is used to reduce rain clutter it also reduces power and range.	124
12	DME: purpose of the twin pulses.	132
12	DME range; quoted as maximum coverage of 200 nm at 30,000 ft.	136
12	“Slant range errors at long distances are practically negligible”. This statement is wrong! See page 138 below.	137
12	Worst case accuracy is ±6 nm at a range of 200 nm.	138
12	Interference due to Wx is reduced on secondary radars (ie DME & SSR).	139

FTA CHAPT	Item Covered	Underdown Page
12	DME relationship with VOR, ie collocated, associated etc.	140/141
12	DME ident; a series of paired pulses at PRF of 1,350 ppps. VOR/DME synchronised idents (VOR every 7.5 secs).	141
12	Impact of RNAV on ATC.	142
12	"Current" system accuracy is BRNAV. Newer systems are PRNAV.	143
14	Advantages: Note the last two bullet points and relate to class discussion.	147
14	Mode S data link has the capacity for over the horizon service.	148
14	Characteristics of Mode S transponders; message capability, data link and 25ft height increments.	148/149
9	ICAO specification for PAR.	152
9	SRA height checks.	154
13	AWR characteristics, especially no reflection from tiny water droplets.	156
13	Geometric shadow behind a hill may give a false impression of water.	159
13	Typical AWR beam width.	160
13	AWR – danger from turbulence and maximum turbulence depends on contour steepness.	163/164
13	AWR – Operation on ground, especially use of tilt up control.	164
10	Radio Altimeter; fixed error and overall accuracy.	171
10	Radio Altimeter gets best reflections from water and frequency difference increases with height.	172
11	Vertical speed sensor is an input to the GPWS computer.	175
11	Operations with an unserviceable GPWS.	175/176
11	GPWS mode 1.	177
11	Windshear is detected by rate of change of both GS and IAS; it is considered to be part of the GPWS.	179
6	Use of Doppler principle in VDF.	195
16	GPS; enabling a range position line to be established.	221
16	At least 4 GPS satellites should always be in view. NB, it does not say 4 are always in view!	222
16	GPS range error associated with satellite orbit inaccuracy is ± 0.5 m.	225

FTA CHAPT	Item Covered	Underdown Page
16	(5) GPS does not indicate failure.	228
15	Compare TCAS 1 with TCAS 2.	230/231
15	TCAS TA characteristics.	231