SVEUČILIŠTE U ZAGREBU
FAKULTET PROMETNIH ZNANOSTI

RADIOTELEPHONY COMMUNICATIONS 1

Handbook

Ivana Francetić, prof.

Zagreb, November 2018

FOREWORD

"Radiotelephony Communications 1 Handbook" is intended primarily for the second-year students of the undergraduate study programme Aeronautics at the Faculty of Transport and Traffic Sciences, both for air-traffic control and military and civil pilots who have enrolled the subject „Radiotelephony communications I".

The entire subject-matter of the mentioned subject, which is included into the teaching material "Radiotelephony Communications 1 Handbook", is defined by Basic ATCO training plan and program [1] and is accordance with the EASA regulation [2].

The teaching material explains the proper use and pronunciation of radiotelephony alphabet and numbers used on the frequency, standardized phraseology for giving information, ATC clearances and ATC instructions for both VFR and IFR aerodrome traffic (arriving and departing traffic). It provides specific examples of communication between a pilot and an air traffic controller in Zagreb control zone (Zagreb CTR) when runway 05 is the runway-in-use. Various situation scenarios are covered providing communication examples in English starting with the initial call to leaving the zone for the departing VFR and IFR traffic or entering the control zone to vacating the runway for the arriving IFR and VFR traffic.

Pilots' communication is always given on the left side of the page, while the controllers' utterances are printed on the right side of the page.

This material shall be of great help to the students of air traffic control module during the practical simulator exercises which are the essential part of the "Aerodrome simulator" subject being held at the Laboratory for Control of Air Navigation, as well as to pilot students during their practical training exercises.

Teaching material may also be used in commercial training courses for both pilots and air traffic controllers.

Students are encouraged to make practical application of material in their future jobs as air traffic controllers or pilots.

Zagreb, 10th October 2018

The author

1 RTF GENERAL OPERATING PROCEDURES (ATMB 3.1)

Pilots and air traffic controllers communicate by using the radiotelephony phraseology that consists of a set of standardized words and phrases. These phrases are prescribed and approved for use on the frequency (for radiotelephony communications) by International Civil Aviation Organization (ICAO) in all routine aircraft situations [3]. The situations the pilots and air-traffic controllers find themselves in are highly predictable, so that the communication is made possible due to their common and work-related topics. Even if misunderstandings do occur, they are rather easily dealt with since both parties involved in the conversation know what replies to expect from each other. Problems arise in non-routine and emergency situations, when pilots and controllers need to switch to plain English because standard phraseology lacks the communicative means for effective communication in unpredictable situations such as on board medical emergencies, engine problems, fuel shortage or acts of unlawful interference. When both parties stick to the rules prescribed, problems in communication will rarely occur. Above all, good transmitting technique is needed.
According to EU regulation [2], standardised phraseology shall be used in all situations for which it has been specified. Only when standardised phraseology cannot serve an intended transmission, plain language shall be used.

1.1 TRANSMITTING TECHNIQUE (ATMB 3.1.2)

According to the Manual of Radiotelephony [3] the following transmitting techniques will assist in ensuring that transmitted speech is clearly and satisfactorily received:

1. Before transmitting, listen out on the frequency to be used to ensure that there will be no interference with a transmission from another station.
2. Be familiar with good microphone operating techniques.
3. Use a normal conversational tone, speak clearly and distinctly.
4. Maintain an even rate of speech not exceeding 100 words per minute. When it is known that elements of the message will be written down by recipient, speak at a slightly slower rate.
5. Maintain the speaking volume at a constant level.
6. A slight pause before and after numbers will assist in making them easier to understand.
7. Avoid using hesitation sounds such as "er".
8. Depress the transmit switch fully before speaking and do not release it until the message is completed. This will ensure that the entire message is transmitted.
9. An irritating and potentially dangerous situation in radiotelephony is a "stuck" microphone button. Operators should always ensure that the button is released after a transmission and the microphone placed in an appropriate place that will ensure that it will not inadvertently be switched on.

1.2 TRANSMISSION OF LETTERS (ATMB 3.1.2)

The phonetic words shall be used when individual letters are required to be transmitted. Some abbreviations have become recognizable through frequent usage and are transmitted without using the phonetic word for each letter e.g. ILS, QNH, QFE. Five letter words denoting significant points or navigational aids are pronounced as words e.g. GOLUN, RASIN.
When it is required to transmit individual letters the following words are to be used according to ICAO Annex 10 [4]. The underlined syllables are to be emphasised when being pronounced.

Table 1: Radiotelephony spelling alphabet

Letter	Word	Pronunciation	Morse code
A	Alpha	AL FAH	. _
B	Bravo	BRAH VOH	_ . . .
C	Charlie	CHAR LEE or SHAR LEE	_ . _ .
D	Delta	DELL TAH	_ . .
E	Echo	ECK OH	.
F	Foxtrot	FOKS TROT	. . _ .
G	Golf	GOLF	_ _ .
H	Hotel	HOH TELL	. . . .
I	India	IN DEE AH	. .
J	Juliet	JEW LEE ETT	. _ _ _
K	Kilo	KEY LOH	_ . _
L	Lima	LEE MAH	. _ . .
M	Mike	MIKE	_ _
N	November	NO VEM BER	_ .
O	Oscar	OSS CAH	_ _ _
P	Papa	PAH PAH	. _ _ .
Q	Quebec	KEH BECK	_ _ . _
R	Romeo	ROW ME OH	. _ .
S	Sierra	SEE AIR RAH	. . .
T	Tango	TANG GO	_
U	Uniform	YOU NEE FORM or OONEE FORM	. . _
V	Victor	VIK TAH	. . . _
W	Whiskey	WISS KEY	. _ _
X	X -ray	ECKS RAY	_ . . _
Y	Yankee	YANG KEY	_ . . _
Z	Zulu	ZOO LOO	_ _ . .

1.3 TRANSMISSION OF NUMBERS (ATMB 3.1.3)

AIC A006/2017 [5] which is based on European regulation [2] clearly states that all numbers shall be transmitted by pronouncing each digit separately. Whole hundreds and whole thousands shall be transmitted by pronouncing each digit in the number of hundreds or thousands followed by the word "HUNDRED" or "THOUSAND". Combinations of thousands and whole hundreds shall be transmitted by pronouncing each digit in the number of thousand separately followed by the word "THOUSAND" and the number of hundreds followed by the word "HUNDRED".

Flight levels shall be transmitted by pronouncing each digit separately as well, except in case of flight levels in whole hundreds, when they are pronounced as "ONE HUNDRED", "TWO HUNDRED" etc.

The altimeter setting shall be transmitted by pronouncing each digit separately, except for the case of a setting of 1000 hPa, which shall be transmitted as "ONE THOUSAND".

All numbers used in the transmission of transponder codes shall be transmitted by pronouncing each digit separately except that, when the transponder codes contain whole thousands only, the information shall be transmitted by pronouncing the digit in the number of thousands followed by the word "THOUSAND".

The following examples illustrate the application of this procedure:

Table 2: Pronunciation of numbers

Numeral	Pronounced as:
0	ZERO
1	WUN
2	TOO
3	TREE
4	FOWER
5	FIFE
6	SIX
7	SEVEN
8	AIT
9	NINER
Hundred	HUN DRED
Thousand	TOU SAND
Decimal	DAY SEE MAL
Point	POINT

Table 3: Pronunciation of more digit numbers

Number	Pronounced as:
10	WUN ZE-RO
75	SEV-en FIFE
100	WUN HUN-dred
583	FIFE AIT TREE
2500	TOO TOU-SAND FIFE HUN-dred
5000	FIFE TOU-SAND
11000	WUN WUN TOU-SAND
18900	WUN AIT TOU-SAND NIN-er HUN-dred
25000	TOO FIFE TOU-SAND
38143	TREE AIT WUN FOW-er TREE

In cases where there is a need to clarify the number transmitted as whole thousands and/or whole hundreds, the number shall be transmitted by pronouncing each digit separately.

Numbers containing a decimal point shall be transmitted with the decimal point in appropriate sequence being indicated by the word “DECIMAL” (in case of frequencies) or “POINT” (in all other cases; Mach number, distance). All six digits of the numerical designator shall be used to identify the transmitting channel in very high frequency (VHF) radiotelephony communications, except in the case of both the fifth and sixth digits being zeros, in which case only the first four digits shall be used.

Example of reporting distance:

ATCO	**PILOT**
CTN123, report distance	
	CTN123, distance 7.5 miles ZAG DME (seven point fife)

Example of reporting Mach number:

CTN123, report Mach number	
	CTN123, 0.75 (point seven fife)
CTN123, reduce to 0.72 (point seven two).	

Table 4:Pronunciation of numbers containing decimal point

Number	Transmitted as:
0,72 Mach	MACH POINT SEVEN TWO
1,2 Mach	MACH ONE POINT TWO
25,5 NM	TWO FIFE POINT FIFE MILES
120.375	ONE TWO ZERO DECIMAL THREE SEVEN FIVE
118.000	ONE ONE EIGHT DECIMAL ZERO
118.005	ONE ONE EIGHT DECIMAL ZERO ZERO FIVE
118.050	ONE ONE EIGHT DECIMAL ZERO FIVE ZERO
118.125	ONE ONE EIGHT DECIMAL ONE TWO FIVE
118.150	ONE ONE EIGHT DECIMAL ONE FIVE ZERO
118,300	ONE ONE EIGHT DECIMAL TREE

1.4 EXCEPTIONS TO NUMBERS

Excepted from these, above mentioned regulations are:

1. Passing traffic information in radar environment regarding the relative bearing to an object or to conflicting traffic in terms of 12-hour. Then numbers 10, 11, 12 shall be transmitted as "TEN", "ELEVEN" or "TWELVE" o'clock (e.g. "CTN662, traffic information, traffic is at 12 o'clock, 6 miles, passing left to right, B737, FL 350")
2. When transmitting numbers in aircraft call sign, headings (track, radial), runway, wind direction and speed, numbers shall be pronounced each digit separately (e.g. heading 300 shall be pronounced as "TREE ZERO ZERO")
3. When giving instruction to fly a 360° turn, (e.g. "Make a TREE SIXTY turn to the left.")
4. When giving instruction to make a U-turn on ground, (e.g. "Make ONE EIGHTY turn".)
5. When reporting visibility 9999 in transmission of METAR information "over 10km" is pronounced TEN.

1.5 VERIFICATION OF NUMBERS

When necessary to verify the accurate reception of numbers, the person transmitting the message shall request the person receiving the message to read back the numbers.

1.6 TRANSMISSION OF TIME (ATMB 3.1.3)

All time references should be made in Co-ordinated universal time (UTC). This used to be called Greenwich Mean Time (GMT). This time zone is sometimes referred to as Zulu (Z). Time is always in the 24-hour clock. 2400 is midnight and 0001 begins the new day.
When transmitting time, only the minutes of the hour are normally required, each figure being pronounced separately.
However, if there is any possibility of confusion or if crossing the hour, the full four-figure group of numbers will be spoken. Correct time, expected approach time (EAT and revised EAT) and SLOT time are to be spoken in hours and minutes (in four figures). EAT and SLOT are to be read back always.
Apart from UTC (Co-ordinated universal time), estimated times of arrival may sometimes be given as local time.

Table 5: Transmission of time

Time	Statement
0920	TWO ZERO or
	ZERO NINER TWO ZERO
EAT 1015	EAT ONE ZERO ONE FIFE
CORRECT TIME 2010	CORRECT TIME TWO ZERO ONE ZERO
1300	WUN TREE ZE-RO ZE-RO
2057	TOO ZE-RO FIFE SEV-en

Pilot may check the time with the appropriate ATS unit. Time check shall be given to the nearest full minute. (It used to be half minute in the past.)

Example of time check:

	CTN 654, request time check
CTN 654, time 0611	
CTN 654, time 0715	

Exercise 1: Numbers in aviation context

Each student is to read out the number from each of the table. Circle them as you hear them. Decide what do numbers contained in each table indicate.

A

05	14	16
32	09	29
22	27	18
10	35	01
07	23	31

B

250	186	340
187	119	191
256	085	153
006	120	275
180	305	075

C

119.300	125.250	121.000
119.025	126.700	135.850
118.275	118.125	118.025
123.750	100.300	114.900
117.005	119.250	122.025

D

1013	1029	1000
1022	1017	997
1001	1031	995
998	1005	1020
1010	999	1009

E

2412	0626	5114
1333	1404	5124
6534	2456	7432
1414	1455	0646
0015	6324	4057

F

1,900	5,000	12,000
500	17,900	18,000
23,000	14,500	800
8,000	6,500	1,700
3,500	1,500	2,500

1.7 CALL SIGNS (ATMB 3.1.6)

ICAO, Annex 10, Chapter 5 distinguishes two types of call signs. Call signs can be considered as names used in aviation to identify aircraft stations and aeronautical stations which are in fact stations on the ground.

1.7.1 AERONAUTICAL STATIONS CALL SIGNS

Call signs of aeronautical stations are prescribed in Manual of Radiotelephony [3]. They consist of two parts, the name of the location they are serving or are situated at and by a suffix denoting unit or the type of service provided.

Table 6: Aeronautical station call signs

UNIT OR SERVICE	CALL SIGN SUFFIX
Aerodrome control	TOWER
Aeronautical station	RADIO
Approach control	APPROACH
Approach control radar arrivals	ARRIVAL
Approach control radar departures	DEPARTURE
Apron control	APRON
Area control centre	CONTROL
Clearance delivery	DELIVERY
Company dispatch	DISPATCH
Company/Aerodrome Handling	OPERATIONS
Direction finding station	HOMER
Flight information service	INFORMATION
Precision approach radar	PRECISION
Radar (in general)	RADAR
Surface movement control	GROUND

When satisfactory communication has been established, i.e. after the initial call and provided that it will not be confusing, the name of the location or the call sign suffix may be omitted. During the communication between the pilot and the air-traffic controller, only the aircraft call sign is being used.

1.7.2 AIRCRAFT CALL SIGNS

Aircraft call signs may contain a maximum of seven characters. There are three types of aircraft call sign according to how they are formed:

a) the characters corresponding to the registration marking of the aircraft; GABCD or Cessna GABCD. (The name of the aircraft manufacturer or name of aircraft model may be used as a radiotelephony prefix);
b) the telephony designator of the aircraft operator, followed by the last four characters of the registration marking of the aircraft; Speedbird DCAB;
c) the telephony designator of the aircraft operator, followed by the flight identification; CTN662.

Full radiotelephony call signs shall always be used when establishing communication i.e. in initial call. An aircraft shall not change its type of call sign during the flight except when there is a possibility that confusion may occur because of similar call sign. Then, an aircraft may be instructed by an air traffic control unit to change the type of its call sign temporarily:

1. instruction to change its type of call sign:
   CHANGE YOUR CALL SIGN TO (new call sign) [UNTIL FURTHER ADVISED]; (when transferred to another ATC unit except when callsign change has been coordinated with them)
2. instruction to an aircraft to revert to the call sign indicated in the flight plan: REVERT TO FLIGHT PLAN CALL SIGN (call sign) [AT (significant point)].

Aircraft call sign may be abbreviated only after:

1. satisfactory communication has been established;
2. it has been addressed in this manner by the aeronautical station;
3. and provided that no confusion is likely to occur.

Aircraft call signs may be abbreviated in the following way:

a) the first character of the registration and at least the last two characters of the call sign (GCD or; Cessna CD);
b) the telephony designator of the aircraft operator followed by at least the last two characters of the aircraft call sign (Speedbird AB);
c) No abbreviated form (CTN662).

Table 7: Aircraft call signs

TYPE	FULL CALL SIGN	ABBREVIATED CALL SIGN
TYPE A	CESSNA FABCD N57826	CESSNA CD N26
TYPE B	VARIG PVMA	VARIG MA
TYPE C	SCANDINAVIAN 937	SCANDINAVIAN 937

Aircraft in the heavy wake turbulence category shall include the word "HEAVY" immediately after the aircraft call sign in the initial contact between such aircraft and ATS units.

Exercise 2: Call signs

Abbreviate the following call signs.

DLH235	PIPER G6768	BAW872	GABCD	CITATION FAMKL	SENECA NHTRY	9AGFE

1.8 CATEGORIES OF MESSAGES AND ORDER OF PRIORITY

According to ICAO Annex 10 [4] all the communication between pilots and air traffic controllers can be categorised into six categories of messages depending on the priority of information being transmitted. Croatian regulation AIC A006/2017 [5] distinguishes the 7th type, called state telegram Here are the categories:

1. **Distress messages** (distress calls, distress traffic)
   It is a condition (those concerning aircraft and passengers) of being threatened by serious and/or imminent danger and of requiring immediate assistance. Radiotelephony signal to be used are words MAYDAY.
2. **Urgency messages**
   It is a condition concerning the safety of an aircraft or other vehicle, or of some person on board or within sight, but which does not require immediate assistance. Radiotelephony signal indicating urgency messages are words PAN, PAN or PAN, PAN MEDICAL.
   Medical transport represents “any means of transportation by land, water, or air, whether military or civilian, permanent or temporary, assigned exclusively to medical transportation and under the control of a competent authority of a Party to the conflict”.
3. **Direction finding message**
   It is communication relating to direction finding, VDF using Q codes, radar vectors i.e. messages for transmission of direction finding values
4. **Flight safety messages**
   - movement and control messages;
   - all messages originated by an aircraft operating agency or by an aircraft, of immediate concern to an aircraft in flight;
   - meteorological advice of immediate concern to an aircraft in flight or about to depart (individually communicated or for broadcast);
   - and all other messages concerning aircraft in flight or about to depart.
5. **Meteorological messages**

These are reports, forecasts, warnings. Messages which comprise meteorological information to or from aircraft (other than those under flight safety messages).

6. **Flight regularity messages**
   - messages regarding the operation or maintenance of facilities essential for the safety or regularity of aircraft operation;
   - messages concerning the servicing of aircraft;
   - instructions to aircraft operating agency representatives concerning changes in requirements for passengers and crew caused by unavoidable deviations from normal operating schedules.
   - messages concerning non-routine landings to be made by the aircraft;
   - messages concerning aircraft parts or materials urgently required;
   - messages concerning changes in aircraft operating schedules.
   - (ATSU using direct pilot-controller communication channels shall only be required to handle flight regularity messages provided this can be achieved without interference with their primary role and no other channels are available for the handling of such messages.)
7. **State telegram** used in Croatian airspace

Note: Categories of messages under 6 and 7 shall be transmitted on the FIS or another frequency assigned by ATC unit to avoid interference with ATC.

Exercise 3: Corrections

Read the sentences and then correct yourself using the information in the brackets:

1. AFR101, climb to FL 180 (170)

2. CTN123, Maintain FL 260 (160)

3. 9ADDA, Reduce speed to 240 (140) kt

4. SAS334, cleared to land RWY 13, (31), wind 120/5

5. 9ACTR, estimating ILB at 45 (54)

6. MPH662, contact Ljubljana Control 187,875 (128,875)

7. 9ADDA, traffic is Cessna 152 (172) from Lučko to N3 point at 1500ft.

8. BAW445, turn left heading 156 (165).

9. OAL662, traffic information, traffic is at 9 o'clock, 8 miles (12), crossing left to right, fast moving

10. SWR152, taxi via taxiway C, turn left to D (E) to holding point RWY 08.

11. 9AZVJ, Pula Tower, departure RWY 09, wind 060/10 knots, (050/9) QNH 999, temp. 25/4, correct time 1645

12. UAE123, 31 miles DME on radial 052 ZAG VOR, (VBA VOR) maintaining FL 330.

13. MAH554, cleared for take-off RWY 25, wind 220/16, (6kt)

14. TAR 123, climb to 3500 ft, (2500).

15. 9ABCD, increase speed to 350 (250) kt

16. AAL537, cleared to land RWY 62, (26), wind 200/10

17. UAL642, contact Budapest Radar 187,875 (128,875)

2 ESTABLISHMENT AND CONTINUATION OF COMMUNICATION

In radiotelephony communications it is considered that the communication has been established after the station being called has answered the call being made by the station calling. After the initial call, only the aircraft call sign shall be used and the aeronautical station call sign is omitted since there can be many aircraft under jurisdiction of the same aeronautical station and communicating with it during a certain time.

2.1 INITIAL CALL

Initial call is the call usually initiated by the pilot and it consists of the pilot's message and the controller's reply. When establishing RT communications, if the pilot initiates it, s/he shall use the full call sign of aeronautical station and the full aircraft call sign. The contact is established when the called station replies using full call sign of the station calling and the station being called. Again, (EU) 2016/1185 [2] clearly states how and when to use initial call.
Unless otherwise prescribed by the ANSP responsible for the provision of services and approved by the competent authority, the initial call to an ATS unit after a change of air-ground voice communication channel shall contain the following elements:

1. the designation of the ATS unit being called;
2. call sign and, for aircraft in the heavy wake turbulence category, the word "Heavy" or "Super" if that aircraft has been so identified by the competent authority;
3. level, including passing and cleared levels, if not maintaining the cleared level; (pilots shall provide level information at the nearest full 30 m or 100 ft as indicated on the pilot's altimeter);
4. speed, if assigned by ATC; and
5. additional elements, as required by the ANSP responsible for the provision of services and approved by the competent authority.

Initial call to aerodrome control tower for aircraft being provided with aerodrome control service, shall contain:

1. the designation of the ATS unit being called;
2. call sign and, for aircraft in the heavy wake turbulence category, the word "Heavy" or "Super" if that aircraft has been so identified by the competent authority;
3. position;
4. additional elements, as required by the ANSP responsible for the provision of services and approved by the competent authority.

After the initial call, only the aircraft call sign is to be used. When a station is called, but it is not certain what the identification of the station calling is, the calling station should be requested to repeat its call sign until identification is established.

Examples of initial call:

ATCO	**PILOT**
	ZAGREB TOWER, 9ADDC, request start up
9ADDC, ZAGREB TOWER, start up approved.	

	Pula Tower, ------ 345
Station calling Pula Tower, say again call sign.	
	Pula Tower, CTN345

	All stations, CTN622 request assistance for Split, relay the message (no call sign was heard).
Station calling Zagreb Tower, say again call sign	

Exercise 4: Initial call

Make initial calls using the data from the table.

ATC	Zagreb ACC	Dubrovnik TWR	Osijek APP	Budapest ACC	Brač TWR	Vienna APP	Lučko TWR
PILOT	9ADDA	BAW2345	9ADMS	CTN359	OE976	AUA248	9ADAS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

2.2 MULTIPLE CALL

Stations in the aeronautical mobile service may simultaneously call several stations. Stations called in multiple call shall acknowledge receipt of the message in the sequence used by the calling station. It is not used in transmission of ATC clearances.

Example of multiple call

CTN380, AZA234, DLH424, monitor ATIS information C.	

2.3 GENERAL CALL

When an aeronautical station broadcasts information to all stations on the same frequency, the message should be prefaced by “all stations”, followed by the call sign of the transmitting station. Aircraft (pilot) shall not attempt to acknowledge the receipt of the general call message.

Example of general call

All stations, Zagreb Tower, anti-hail activity south of the aerodrome completed.	

2.4 ACKNOWLEDGEMENT OF MESSAGE RECEIPT

Acknowledgement of the receipt of aircraft/aeronautical station message is made by transmission of the aircraft call sign and the word ROGER may be added.

Example of message receipt acknowledgment:

	Fastair 345 unable to comply, TCAS Resolution Advisory
Fastair 345, Roger.	

3 STANDARD WORDS AND PHRASES

According to ICAO Annex 10 [4] the following phrases and their meanings are to be used in standard communication between pilots and air traffic controllers. Phrases written in italics are being still used in everyday radiotelephony communication but have been excluded from the ICAO documents.

Table 8: Standard words and phrases

PHRASE	DEFINITION
ACKNOWLEDGE	Let me know that you received and understood this message.
ADVISE	*Tell us/Inform us on/of/about...*
AFFIRM	Yes.
AIRBORNE (HR)	*The time the flight has started after the take-off phase.*
APPROVED	Permission for proposed action granted.
BREAK	I hereby indicate the separation between portions of the message. (To be used where there is no clear distinction between the text and other portions of the message.)
BREAK BREAK	I hereby indicate the separation between messages transmitted to different addressees in a very busy environment.
CANCEL	Annul the previously transmitted clearance.
CAUTION (HR)	*Beware of the following conditions or situations.*
CHECK	Examine a system or procedure. (No answer is normally expected.)
CLEARED	Authorized to proceed under the conditions specified.
CLIMB	*Climb to maintain (to level out).*
COMPLY	*Act in compliance with a request or instruction.*
CONFIRM	I request verification of: (clearance, instruction, action, information).
CONTACT	Establish communications with ...
CORRECT	True or accurate.
CORRECTION	An error has been made in this transmission (or message indicated). The correct version is...
CROSS	*Fly/taxi across. Pass from one side to the other side of...*
DEPART	*Leave.*
DEPARTURE	*Take-off, departing.*
DESCEND	*Descend to maintain (to level out).*
DISREGARD	Ignore.
ESTIMATE	*Calculate/make approximate calculation.*
EXPEDITE	*Speed up, increase speed/rate.*
HOLD	*Keep in place or condition.*

HOLD SHORT	*Keep at a distance/keep away of/ stop before reaching the specified location…*
HOW DO YOU READ	What is the readability of my transmission?
IMMEDIATEL(LY)	*At once, without delay due immanent risk/hazard*
I SAY AGAIN	I repeat for clarity or emphasis.
LEAVE	*Depart, abandon, go away from.*
LOOK OUT (FOR)	*View over, survey inspection (watch out for immanent risk/hazard.)*
MAINTAIN	Continue in accordance with the condition(s) specified or in its literal sense, e.g. Maintain VFR.
MONITOR	Listen out on (frequency).
NEGATIVE	No/Permission not granted/That is not correct/Not capable.
OUT	This exchange of transmission is ended and no response is expected. (Not normally used in VHF communications)
OVER	My transmission is ended and I expect a response from you. (Not normally used in VHF communications)
READ	*Hear and understand*
READ BACK	Repeat all, or the specified part of this message back to me exactly as received.
RECLEARED	A change has been made to your last clearance and this new clearance supersedes your previous clearance or part thereof.
REPORT	Pass me the following information...
REQUEST	I should like to know/I wish to obtain...
REVISION	*Reconsidered or corrected version/calculation of time.*
ROGER	I have received all of your last transmission.
SAY AGAIN	Repeat all, or the following part of your last transmission.
SLOW DOWN	*Reduce your speed*
SPEAK SLOWER	Reduce your rate of speech.
SQUAWK	*Set the mode/code as instructed.*
STANDBY	Wait and I will call you.
UNABLE	I cannot comply with your request, instruction or clearance. (normally followed by a reason)
VERIFY	*Check and confirm with originator.*
WILCO	I understand your message and will comply with it.
WORDS TWICE	a) As a request: Communication is difficult. Please send every word, or group of words, twice. b) As information: Since communication is difficult, every word, or group of words, in this message will be sent twice.

4 ATC CLEARANCES AND ATC INSTRUCTIONS

Manual or Radiotelephony [3] distinguishes ATC clearance from ATC instruction.
Air traffic control clearance is an authorization for an aircraft to proceed under conditions specified by an air traffic control unit. For convenience, the term “air traffic control clearance” is frequently abbreviated to “clearance” when used in appropriate contexts. The abbreviated term “clearance” may be prefixed by the words “taxi”, “take-off”, “departure”, “en-route”, “approach” or “landing” to indicate the particular portion of flight to which the air traffic control clearance relates.

Air traffic control instructions are directives issued by air traffic control for the purpose of requiring a pilot to take a specific action.

Other related term which are used closely related to RTF:

- ‘controlled flight’ means any flight which is subject to an air traffic control clearance;
- ‘clearance limit’ means the point to which an aircraft is granted an air traffic control clearance;
- ‘downstream clearance’ means a clearance issued to an aircraft by an air traffic control unit that is not the current controlling authority of that aircraft;

ATC clearance shall indicate:

- aircraft identification as shown in the flight plan;
- clearance limit;
- route of flight;
- level(s) of flight for the entire route or part thereof and changes of levels if required;
- any necessary instructions or information on other matters such as approach or departure manoeuvres, communications and the time of expiry of the clearance.

The flight crew shall read back to the air traffic controller safety-related parts of ATC clearances and instructions which are transmitted by voice. Voice read-back of CPDLC messages shall not be required, unless otherwise specified by the ANSP.

Other clearances or instructions, including conditional clearances and taxi instructions, shall be read back or acknowledged in a manner to clearly indicate that they have been understood and will be complied with.
The controller shall listen to the read-back to ascertain that the clearance or instruction has been correctly acknowledged by the flight crew and shall take immediate action to correct any discrepancies revealed by the read-back.

Exercise 5: Phrases

Match the phrases in the box to the definitions A to T. (RMIT [6])

A	Agree or repeat something that is correct	**K**	Tell someone you have heard them
B	Check something and continue to check	**L**	Follow an existing written procedure
C	Cancel the approach	**M**	Change heading
D	Inform or recommend	**N**	Cross a flight path
E	Change course to a new position	**O**	Do not continue
F	Change or improve a setting	**P**	Don't do something previously arranged
G	Inform when this is done	**Q**	Go somewhere else
H	Decrease	**R**	Make greater or higher
I	Don't do/don't include something	**S**	Do something as quickly and safely as possible
J	Follow a line or flight path	**T**	Something should happen as discussed

PHRASES:

	Reduce		Increase		Make published		Advise
	Hold		Leave		Acknowledge		Monitor
	Confirm		Intercept		Cancel		Expect
	Omit		Divert		Expedite		Report
	Turn		Track		Adjust		Go around

5 READBACK REQUIREMENTS

Important instructions issued by the ATCO need to be repeated by the pilots so that it is made certain that the pilot has heard the message correctly as stated in AIC A 006/2017 [5]. The ATCO will acknowledge the correct read-back by transmitting the aircraft call sign and the phrase "CORRECT". In case a pilot reads back a clearance incorrectly, the controller shall transmit the phrase "NEGATIVE" followed by the call sign and the correct version of the clearance. The correct readback of the clearance shall be acknowledged by aircraft callsign and the phrase "CORRECT".

Examples of readback requirements:

ATCO	**PILOT**
	CTN123, ready for departure.
CTN123, cleared for take-off RWY 15, wind 140°/7kt.	
	Cleared for take-off RWY 15, CTN123
CTN123, correct.	

	CTN123, request descent.
CTN123, descend to FL 150	
	Leaving FL 310, descending FL 160, CTN123
CTN123, negative, descend to FL 150.	
	Leaving FL 310, descending FL 150, CTN123
CTN123, correct.	

Exercise 6: Readback requirements

The following instructions are to be read back, i.e. are to be transmitted by verbatim repetition using the same words and the same sequence and are to be concluded with the aircraft call sign.

1. ATS ROUTE CLEARANCES
   C: CTN663, cleared to Zagreb via flight planned route, FL 190, CRE 2D, squawk 7065.

   _____

   _____

   C: AUA644, Zagreb Radar, identified, cleared to PIS, descend to 9 000 ft, QNH 1010, TL 95, expect ILS approach RWY 05.

   _____

   _____

2. ALTIMETER SETTINGS
   C: 9ABPW, QNH 1003.

   _____

3. LEVEL INSTRUCTIONS
   C: CTN320, descend to 3000ft

   _____.

   C: CTN320, after passing ZAG descend to FL 210.

   _____

4. SPEED INSTRUCTIONS
   C: CTN663, maintain present speed.

   _____

   C: CTN663, increase speed to 220 kt.

   _____

5. HEADING INSTRUCTIONS
   C: 9ADDA, turn right heading 150.

   _____

   C: CTN663, fly present heading.

   _____

6. ATIS CODE LETTER
   C: 9ADDA, check information C.

   _____

7. SSR OPERATING INSTRUCTIONS/SSR CODES
   C: 9ACBE, squawk 6502.

   _____

   C: CTN320, confirm squawk 5505.

   _____

8. SLOT TIME
   C: CTN622, slot time 0805.

   _____

9. FREQUENCY CHANGES
   C: 9ADDA, contact Zagreb Tower 118,3.

   _____

   C: 9ADDA, monitor Zagreb Radar on 135,8.

   _____

10. APPROACH CLEARANCES (EAT - EXPECTED APPROACH TIME inclusive)
    C: CTN505, EAT 1010

    _____

11. TAXI INSTRUCTIONS
    C: 9AHGD taxi to holding point RWY 23.

    _____

12. TRANSITION LEVEL

C: CTN663, descend to 6000 ft, QNH 1013, transition level 70

13. CONDITION OF A CONDITIONAL CLEARNACES

C: CTN663, after passing KOPRY, climb to FL 290.

14. RUNWAY DESIGNATOR CLEARANCES AND INSTRUCTIONS (INCLUDING THE CONDITION OF A CONDITIONAL CLEARANCE) TO:

a) ENTER

C: CTN662, cleared to enter RWY 31.

b) LAND ON

C: CTN662, cleared to land RWY 05, wind 050 degrees, 4 kt.

c) TAKE OFF

C: CTN662, cleared for take-off, wind 230 degrees, 5 kt.

d) REJECT TAKE OFF

C: CTN662, stop immediately, CTN662, stop immediately, aircraft crossing the RWY.

C: CTN662, hold position, cancel, I say again, cancel take off clearance, vehicle on the RWY.

e) CROSS

C: CTN662, cleared to cross RWY 05.

f) BACKTRACK

C: CTN662, cleared to backtrack RWY 09.

g) LINE UP

C: CTN662, line up RWY 05.

h) HOLD SHORT OF AN ACTIVE RUNWAY

C: CTN662, hold short of RWY 05.

6 TEST PROCEDURES - RADIO CHECK AND READABILITY SCALE (ATMB 3.1.9.)

As explained in Manual on Radiotelephony [3] when radio checks are made , the following readability scale is to be used to indicate the quality of the transmission:

Table 9: Readability scale

Quality	Scale
Unreadable	1
Readable now and then	2
Readable but with difficulty	3
Readable	4
Perfectly readable	5

Test transmissions should consist of the following items:

1. the identification of the aeronautical station being called
2. the aircraft identification
3. the words "RADIO CHECK"
4. the frequency being used

Replies to test transmissions contain the following items:

1. the identification of the station calling
2. the identification of the station replying
3. information regarding the readability of transmission

Example of radio check procedure:

	Zagreb Tower, 9ADAS, radio check 118,3 (box 1)
9ADAS, Zagreb Tower, read you five 9ADAS, Zagreb Tower, read you three, with a loud background whistle.	

NOTE. - The readability of a transmission should be classified by the number (Table 9), together with any other information regarding the transmission which may be useful to the station making the test.

Exercise 7: Radio check

Work in pairs. Produce examples of radio check using the following prompts**.**

ZAGREB TOWER CTN692 118.275	SPLIT TOWER CTN622 124.725	DUBROVNIK TOWER MAH492 120.005	ZAGREB TOWER OAL523 121.225
ZAGREB TOWER DLH392 119.005	ZAGREB TOWER CTN125 123.250	ZAGREB TOWER THY226 118.350	ZAGREB TOWER MYT546 118.025
PULA TOWER BAW407 117.255	ZAGREB TOWER SAS257 121.010	ZAGREB TOWER JAL658 119.500	ZAGREB TOWER TSO453 119.150

1. P:_____
   C:_____
2. P:_____
   C:_____
3. P:_____
   C:_____
4. P:_____
   C:_____

Table 10: ATC units and their frequencies used for Radar Simulator exercises at the Department of aeronautics:

UNIT	AREA	CALL SIGN	FREQUENCY
Banja Luka APP	TMA Banja Luka	Banja Luka Approach	122.575
Beograd ACC/North	FIR/UIR Beograd/North	Beograd Radar	133.450
Beograd ACC/West	FIR/UIR Beograd/West	Beograd Radar	123.775
Budapest ACC	FIR/UIR Budapest	Budapest Radar	133.200
Graz APP	TMA Graz	Graz Radar	119.300
Ljubljana ACC	FIR/UIR Ljubljana	Ljubljana Radar	135.275
Maribor APP	TMA Maribor	Maribor Approach	119.200
Vienna ACC	FIR/UIR Vienna	Vienna Radar	132.600
Zagreb ACC	FIR/UIR Zagreb	Zagreb Radar	134.455
Zagreb ACC/Adria	FIR/UIR Zagreb/Adria	Zagreb Radar	135.800
Zagreb ACC/Lower North	FIR/Lower Zagreb/North	Zagreb Radar	129.650
Zagreb TWR	CTR Zagreb	Zagreb Tower	118.300

7 Q CODES (ATMB 3.1.5.)

The Q code is a standardized collection of three-letter message encodings [7]. They all start with the letter "Q", which was initially developed for commercial radiotelegraph communication, and later adopted by other radio services, especially amateur radio. Although Q codes were created when Morse code was exclusively used for radio communication, they continued to be employed after the introduction of voice transmissions. The codes in the range QAA-QNZ are reserved for aeronautical use; QOA-QOZ for maritime use, and QRA-QUZ for all services.

Q codes were used extensively in aviation when much of the communication work (especially HF-long range) was done in Morse code. QNH was quicker to “key-in” than A.L.T.I.M.E.T.E.R. S.E.T.T.I.N.G S.E.A. L.E.V.E.L. P.R.E.S.S.U.R.E.

Today some Q-codes are still widely used in aviation because they are useful abbreviations. They are spoken in plain English, not phonetically.

Table 11: Altimeter settings

Q CODE	MEANING
QFE	Atmospheric pressure at aerodrome elevation (or at RWY threshold)
QFU	Magnetic orientation of runway
QGH	Controlled descent through cloud
QNE	Standard pressure (1013.25 hPa) baseline pressure setting equivalent to the ISA at sea level
QNH	Altimeter sub-scale setting to obtain altitude above mean sea level (elevation when on the ground)

Table 12: Direction finding

Q CODE	MEANING
QDM	Magnetic direction TO a facility/ Magnetic heading (with nil wind)
QDR	Magnetic bearing (radial) FROM a facility
QTE	True bearing FROM a facility (station)
QUJ	True bearing TO a facility (station)

8 METEOROLOGICAL INFORMATION (ATMB 4.2.4)

Meteorological information in the form of reports, forecasts or warnings is made available to pilots using aeronautical mobile service either by broadcast (e.g. VOLMET) or by means of specific transmissions from ground personnel to pilots. The phraseologies to be used by ATS personnel and other ground personnel in transmitting information on meteorological conditions, in particular from the content of local routine and special reports, are given in Chapter 12 of Doc 4444 [9]. Standard meteorological abbreviations and terms should be used and the information should be transmitted slowly and pronounced clearly in order that the recipient may record such data when necessary. The following forms should be used:

- WIND (number) DEGREES (number) (units)
- WIND AT (height/altitude/flight level) (number) DEGREES (number) (units)
- VISIBILITY (distance) [direction]
- PRESENT WEATHER (details)
- CLOUD (amount, [type] and height of base) (or SKY CLEAR)
- CAVOK
- TEMPERATURE [MINUS] (number) (and/or DEW POINT [MINUS] (number))
- QNH (or QFE) (number) [units]
- MODERATE (or TURBULENCE) [IN CLOUD] (area)
- REPORT FLIGHT CONDITIONS

Example of a meteorological information being transmitted:

9ADDA, Zadar present weather: wind 360 degrees, 5 knots, visibility over 10 kilometres, few at 2500 feet, QNH 1008, time 1005	
	QNH 1008, 9ADDA
9ADDA, correct	
CTN662, Zagreb: wind 360 degrees, 25 knots, visibility 1000 metres, continuous moderate rain, overcast 600 feet, QNH 1001	
	QNH 1001, what is the temperature, CTN662
CTN662, correct, temperature 7	
	CTN662

8.1 WAKE VORTEX SEPARATION

Wake turbulence is turbulence that forms behind an aircraft as it passes through the air. This turbulence includes various components, the most important of which are wingtip vortices and jetwash. Jetwash refers simply to the rapidly moving gasses expelled from a jet engine; it is extremely turbulent, but of short duration. Wingtip vortices, on the other hand, are much more stable and can remain in the air for up to two minutes after the passage of an aircraft. Wingtip vortices make up the primary and most dangerous component of wake turbulence.
Wake turbulence is especially hazardous during the landing and take-off phases of flight, for three reasons. The first is that during take-off and landing, aircraft operate at low speeds and high angle of attack. This flight attitude maximizes the formation of dangerous wingtip vortices. Secondly, take-off and landing are the times when a plane is operating closest to its stall speed and to the ground i.e. there is little margin for recovery in the event of encountering another aircraft's wake turbulence. Thirdly, these phases of flight put aircraft closest together and along the same flight path, maximizing the chance of encountering the phenomenon.
ICAO Doc 4444 [9] mandates separation minima based upon wake vortex categories that are, in turn, based upon the Maximum Take Off Mass (MTOM) of the aircraft.

Table 13: MTOM minima are categorized as follows

ABBREVIATION	CATEGORY	MTOM
L	Light	7,000 kilograms or less
M	Medium	greater than 7,000 kilograms, but less than 136,000 kg
H	Heavy	136,000 kilograms or greater
J	Super	over 560 000 kg (A380-800)

8.2 ESSENTIAL INFORMATION ON AERODROME CONDITIONS

Essential information on aerodrome conditions is information necessary to safety in the operation of aircraft, which refers to the movement area or any facilities usually associated with it as stated in ICAO Doc 4444 [9]. For example, construction work on a taxi strip not connected to the runway-in-use would not be essential information to any aircraft except one that might be taxiing in the vicinity of the construction work. If all traffic has to be confined to runways, that fact should be considered as essential aerodrome information to any aircraft not familiar with the aerodrome. Essential information on aerodrome conditions includes:

1. construction or maintenance work on or immediately adjacent to the movement area
2. rough or broken surfaces on a RWY, TWY or apron whether marked or not
3. snow, slush or ice on a RWY, TWY or apron
4. water on RWY, TWY or apron

5. snow banks or drifts adjacent to RWY, TWY or apron
6. other temporary hazards including parked A/C and birds on the ground or in the air
7. failure or irregular operation of a part or all of the aerodrome lighting system
8. any other pertinent information

8.3 RUNWAY SURFACE CONDITIONS

Procedures for the measurement and reporting of runway surface conditions are detailed in ICAO Annex 14 [10].
Reports from pilots may be re-transmitted by a controller when it is felt that the information may prove useful to other aircraft:

CTN 622, braking action medium reported by A319 at 1025.

8.3.1 AMOUNT OF WATER ON THE RUNWAY

The runway conditions are very important for the aircraft landing and taking off from a certain airport. The controller shall inform the pilot of the amount of water on the runway whenever possible. The terminology used is the following:

Table 14: Amount of water on the runway

TERM	MEANING
DAMP	the surface shows a change of colour due to moisture.
WET	the surface is soaked but there is no standing water.
WATER PATCHES	patches of standing water are visible on the runway.
FLOODED	extensive standing water is visible on the runway.

Whenever a controller deems it necessary, information that water is on a runway shall be passed to aircraft using the terms from the Table 14 according to the amount of water present.

Example of transmitting the runway conditions:

RWY (or TWY) WET [or DUMP, WATER PATCHES, FLOODED (depth), or SNOW REMOVED (length and width as applicable),

RWY treated, or covered with patches of dry snow (or wet snow, or compacted snow, or slush; or frozen slush, or ice, or ice underneath, or ice and snow, or snowdrifts or frozen ruts and ridges)]

8.3.2 BRAKING ACTION

Braking action in aviation is a description of how easily an aircraft can stop after landing on a runway. Either pilots or airport management can report the braking action.
When reporting braking action, any of the following terms may be used: Good, Medium (it used to be known as Fair), Poor, Nil (bad or no braking action, not measured; in SNOTAM NIL refers to the deposits over total runway length i.e. clear and dry). Friction can be measured on each third of the runway by friction measuring device (from SNOTAM).

Table 15: Braking action

MEASURED OR CALCULATED COEFICIENT	ESTIMATED SURFACE FRICTION	
040 and above	Good	5
0.39 to 0.36	Medium/good	4
0.35 to 0.30	Medium	3
0.29 to 0.26	Medium/poor	2
0.25 and below	Poor	1
9 - unreliable	Unreliable	9

Other runway surface conditions which may be of concern to a pilot shall be transmitted at an appropriate time.
Example of runway surface conditions transmission:

RWY REPORT AT (observation time), RWY (number) (type of precipitant) UP TO (depth of deposit) MILIMETRES. BRAKING ACTION GOOD (or MEDIUM TO GOOD, or MEDIUM, or MEDIUM TO POOR, or POOR, or UNRELIABLE) [and/or BRAKING COEFFICIENT (equipment and number)]

9ADDA, Zadar Tower, grass mowing in progress near centre of aerodrome	
	9ADDA, mowers in sight
CTN663, threshold RWY 27 displaced 500 feet due broken surface	
CTN663, TWY G closed due maintenance. Use A to vacate.	
CTN662, braking action medium, heavy rain, time of measurement 0830	
	CTN662, roger

8.4 WEATHER INFORMATION

Weather information should include the following information given in this order:

1) RUNWAY
2) WIND
3) QNH
4) TEMPERATURE
5) DEW POINT
6) VISIBILITY
7) CLOUDS
8) PRECIPITATION
9) CORRECT TIME

8.4.1 RUNWAY VISUAL RANGE

When transmitting the runway visual range the words "RUNWAY VISUAL RANGE" or the abbreviation RVR should be used followed by the runway number, the position for multiple readings, if necessary, and the RVR value(s): RUNWAY VISUAL RANGE (or RVR) [RUNWAY (number)] (distance).

When multiple RVR observations are available, they are always transmitted commencing with the reading for the touchdown zone, being followed by mid-point and far end (stop end).

CTN662, RVR RWY 23 touchdown 650 metres, mid-point 700 metres, stop end 600 metres	
	CTN662, roger

In the event that RVR information on any position is not available this information will be included in the appropriate sequence:
RVR [RWY (number)] (first position) (distance), (second position) MISSING, (third position) (distance).

8.4.2 SKY COVERING IN OKTAS

Sky covering refers to the amount of sky being covered by clouds. The sky is divided into eight parts or oktas and according to the number of oktas being covered by clouds, the following expressions are used:

Table 16: Sky covering

ABBREVIATION	MEANING	OKTAS
FEW	Few	1/8 – 2/8
SCT	Scattered	3/8 – 4/8
BKN	Broken	5/8 – 7/8
OVC	Overcast	8/8
SKC	Sky clear	0/8

Other terms being used in connection to cloud cover are:

NSC – nil significant clouds
CAVOK – clouds/ceiling, visibility and weather O.K.

8.4.3 DEW POINT

Dew point is the air temperature at which a sample of air would reach 100% humidity based upon its current degree of saturation.

Once the relative humidity of a mass of air becomes 100%, then if the temperature falls it cannot hold all of the water vapour within it. The excess water vapour will then condense into cloud or fog or, if in contact with objects on or near the ground, will form dew or hoar frost.

When observing successive weather reports (METARs), a reducing gap between the actual temperature and the Dew Point temperature gives an indication of impending low visibility conditions and the possibility of fog.

	ZAGREB TOWER, CTN662, request weather information
CTN662, Zagreb Tower, departure RWY 05, wind 040 degrees, 5 knots, QNH 1016, temperature 6, dew point 5, visibility 6 km, BKN at 1500ft, OVC at 4000ft, light rain, correct time 0611	
	Departure RWY 05, QNH 1016, CTN662

8.5 VOLMET

VOLMET or voice weather broadcast represents meteorological aerodrome reports for certain aerodromes which are broadcast on specified frequencies. The call sign of the VOLMET, frequency, operating hours, aerodromes contained within the group, and contents are published in the AIP. All broadcasts are in English. (Zagreb VOLMET frequency 127,800 MHz.) The content of a VOLMET broadcast is as follows:

1. aerodrome identification
2. surface wind
3. visibility
4. RVR (if applicable)
5. weather
6. cloud
7. temperature
8. dew point
9. QNH
10. Trend (if applicable)

Non-essential words such as "surface wind", "visibility" etc. are not spoken.
"SNOCLO" is used to indicate that aerodrome is unusable for take-off/landings due to heavy snow on runway(s) or snow clearance.

8.6 SIGMET

SIGMET i.e. Significant Meteorological Information warning is a brief information on the occurrence of weather phenomena in FIR, which may have impact on aircraft operations (thunderstorms, severe turbulence, severe icing, mountain wave, heavy dust storm, heavy sand storm, volcanic ash cloud, volcanic eruption, radioactive cloud). This information is usually broadcast on the ATIS at ATC facilities, as well as over VOLMET stations.

8.7 METAR

METAR i.e. Meteorological Terminal Air Report is aerodrome routine meteorological report. It is a format for reporting weather information to pilots. A typical METAR contains data for the temperature, dew point, wind direction and speed, precipitation, cloud cover and heights, visibility, and pressure. It may also contain information on precipitation amounts, lightning, and other information such as a pilot report or PIREP and runway visual range (RVR). Sometimes, a TREND, which is a short period forecast, may be added to METAR.

8.8 AUTOMATIC TERMINAL INFORMATION SERVICE (ATIS)

To alleviate RTF loading at some busy airports, ATIS messages are broadcast to pass routine arrival/departure information on a discrete RTF frequency or on an appropriate VOR. It is a recorded message being played in a continuous loop. It is coded using the phonetic alphabet and with every change in ATIS message, the code (name) of the ATIS changes. Pilots inbound to the airports are normally required on first contact with the aerodrome ATSU to acknowledge receipt of current information by quoting the code letter of the broadcast. Pilots of outbound aircraft are not normally required to acknowledge receipt of departure ATIS except when requested on the actual ATIS broadcast.
Aerodromes possessing ATIS, the hours of ATIS operation and the frequency employed are published in the AIP.
ATIS broadcast will include the following:

1. Message identification i.e. "This is Zagreb Information Alpha".
2. Time of origin of weather report
3. Weather report
4. Runway(s) in use
5. Short term AIS information such as unserviceability of NAV AIDS, runway surfaces, etc.
6. Any other routine information useful to pilots operating at the aerodrome.

The QFE and RVR/RVRs are not included.
Rapidly changing meteorological situations sometimes make it impractical to include weather reports in the broadcast. In these circumstances, ATIS messages will indicate that weather information will be passed on RTF.
Any significant change to the content of a current ATIS message will be passed to pilots by RTF until such time as a new message is broadcast.
The highest cloud base that will be reported is 10,000 feet.
The recording is updated in fixed intervals or when there is a significant change in the information.

An example of ATIS broadcast:
"This is Zagreb Information Alpha, 0850 hours weather. Wind 240° 12kt 10 km, intermittent slight rain, 3 octas 1000 ft, 8 octas 1800 ft, temperature +12, dew point +7, QNH 1011 hPa, landing RWY 23."

The pilot should report the received ATIS on first contact with the Tower, if not, ATC should provide the information:

	Zadar Tower, 9AHGD, Information A received
CTN123, check information G	
9AHGD, ATIS available on frequency 124,370, check information B	

Exercise 8: Listening to ATIS:

Listen to the following ATIS recordings from Robertson [11] and make notes for each one in the table below :

AIRPORT	**INFO.**	**TIME**	**RWY**	**WIND**	**TEMP/ DP**	**TL**	**NAV AIDS**	**METEO INFO**	**OTHER**
Schipol									
Rexbury									
Zurich									
Baden									
Mauignac									
Heathrow									
Brest Guipavas									
Eggenfelden									
Tallin									
Khabarovsk									

Exercise 9: Prepositions

Read the aircraft and ATC transmissions A to S below, and circle the correct choice of the provided prepositions under 1, 2, or 3 (RMIT [6]).

	INSTRUCTION	1	2	3	REST OF INSTRUCTION
A	Taxi	to	by	with	caution.
B	Maintain profile speed	in	between	on	descent.
C	Give way	to	from	by	Qantas 767.
D	Wind is 120 degrees	at	by	to	10 kn, gusting 20 kn
E	Request intersection departure	between	from	by	taxiway J.
F	Pacific 328, descend	with	at	to	8000, QNH 1011.
G	Traffic, a B737, is out	at	in	to	your left.
H	The A320 is currently	by	on	in	your 12 o'clock.
I	Hold short	from	of	to	runway 09
J	Ibisair 810, cancel speed restrictions	to	on	in	climb.
K	Taxi	by	between	to	holding point A.
L	We're experiencing some moderate turbulence	in	on	between	FL 250 and 230.
M	Give way to traffic	by	on	in	your left.
N	Qantas 10 will be passing FL 270	on	with	at	time 45
O	Pacific 16, reduce speed	at	to	on	210 kn for sequencing.
P	Qantas 10, reduce speed	by	at	from	50 kn.
Q	Skystar 333, climb to be at FL 350	in	from	by	35.
R	Croatia 981, expedite descent	until	to	at	passing FL 200.
S	Thai 446, there's a 737 approaching	at	to	from	your left.

9 ORDER OF INSTRUCTIONS IN AERODROME CONTROL ENVIRONMENT

VFR DEPARTURES

1. INITIAL CALL + TAXI (DEPARTURE) INSTRUCTIONS
2. ATC CLEARANCE
3. TAKE OFF CLEARANCE
4. AIRBORNE AND/OR POSITION REPORT
5. FREQUENCY CHANGE

VFR ARRIVALS

1. INITIAL CALL + POSITION REPORT
2. JOINING INSTRUCTIONS
3. JOINING TRAFFIC CIRCUIT
4. LANDING CLEARANCE (LOW PASS/LOW APPROACH/ TOUCH AND GO CLR.)
5. INSTRUCTION TO VACATE THE RUNWAY (OR INSTRUCTION WHAT TO DO AFTER LOW PASS/LOW APPROACH/ TOUCH AND GO)

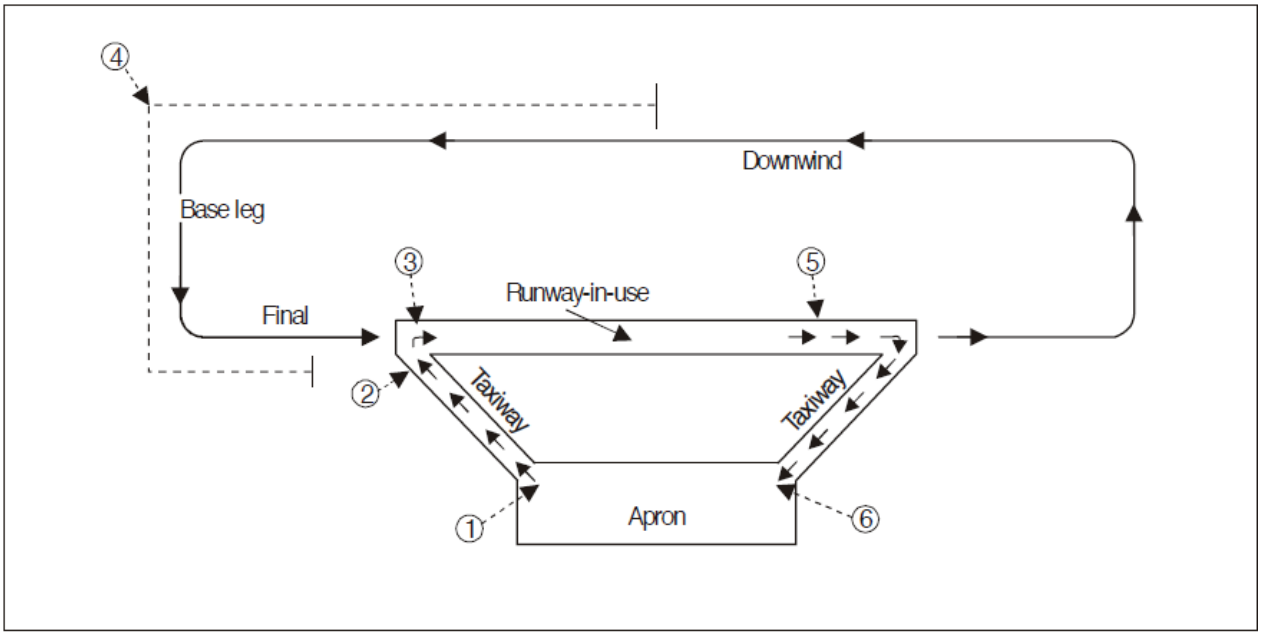
IFR DEPARTURES

1. INITIAL CALL + DEPARTURE INFORMATION
2. START UP CLEARANCE
3. TAXI INSTRUCTIONS
4. ATC CLEARANCE
5. TAKE OFF CLEARANCE
6. AIRBORNE
7. FREQUENCY CHANGE

IFR ARRIVALS

1. INITIAL CALL + POSITION REPORT
2. REPORT OUTER MARKER
3. LANDING CLEARANCE
4. INSTRUCTION TO VACATE THE RUNWAY

Picture 1: Aerodrome traffic circuit



Picture 1 shows at which positions in the aerodrome traffic circuit communication is to be initiated or conducted between the pilot and air traffic controller according to the ICAO Doc 4444 [9].

Position 1 – Aircraft initiates call and requests taxi instructions

Position 2 – Holding position is the last position where the aircraft is to be given ATC clearance. Take off clearance can be given here as well if there is no conflicting traffic

Position 3 – Aircraft is given take off clearance if it was not practicable at position 2

Position 4 – Aircraft is issued clearance to land.

Position 5 – Aircraft is given clearance to taxi to the apron.

Position 6 – aircraft is provided with parking information.

9.1 DEPARTURE INFORMATION (ATMB 4.1.1.1.)

At the airports with no ATIS, departing aircraft may ask for departure information upon first contact with the tower air traffic controller. There is a difference between departure information being given to the IFR and to the VFR traffic.

The following elements of departure information are given to the IFR flights:

PILOT	**AIR TRAFFIC CONTROLLER**
	CS, CS, (IFR/VFR TO DESTINATION), REQUEST DEPARTURE INFORMATION
CS, CS, DEPARTURE RUNWAY, WIND, QNH, TEMPERATURE, DEW POINT, RVR, (VISIBILITY), DEPARTURE SLOT, CORRECT TIME	

Example of departure information given by Zagreb Tower to an IFR flight

	Zagreb Tower, CTN662, IFR to Split, request departure information
CTN662, Zagreb Tower, departure RWY 05, wind 040 degrees 5 knots, QNH 1018, temperature 6, dew point 5, visibility 6 km, departure SLOT 0705, correct time 0611.	
	Departure RWY 05, QNH 1018, SLOT 0705, CTN662
CTN662, CORRECT	

Example of departure information given by Zagreb Tower to a VFR flight

	Zagreb Tower, 9AHGD, request departure information
9AHGD, Zagreb Tower, (good morning), departure RWY 23, wind 220º/16kt, QNH 1005, temperature 21, dew point 9, (correct) time 1015	
	RWY23, QNH 1005, 9AHGD
9AHGD, correct	

Example of departure information given by Zadar Tower

	Zadar Tower, 9AHGD, request departure information
9AHGD, Zadar Tower, departure RWY 32, wind 300º/16kt, QNH 1001, temperature 2, dew point 3, RVR 800m, time 0715	
	RWY 32, QNH 1001, 9AHGD
9AHGD, correct	

Example of departure information given by Pula Tower

	Pula Tower, 9AZVJ, request departure information
9AZVJ, Pula Tower, departure RWY 09, wind 060º/10kt, QNH 999, temp. 25/4, correct time 1645.	
	RWY09, QNH 999, 9AZVJ
9AZVJ, correct	

Exercises 10: Departure information

Work in pairs. Using the given data produce the pilot-controller communication on departure information.

	AERODROME	RUNWAY	WIND	QNH	TEMP/DP	TIME
A	LDPL	09	090/8	1018	15/4	1010
B	LDZA	23	280/15	998	24/3	1600
C	LDSP	23	310/10	1010	15/2	0911
D	LDSB	04	100/20	1014	18/3	0926
E	LDZD	22	210/06	1009	17/7	1802
F	LDRI	14	120/09	1000	09/1	2215
G	LDOS	29	300/08	1004	22/06	1532
H	LDDU	12	100/07	1013	33/5	1246
I	LDLO	02	050/09	1005	30/6	0847
J	LDZL	28L	300/06	1016	15/10	1319
K	LDZD	14	100/09	999	32/2	0709
L	LDZD	32	280/12	1023	28/01	0945

9.2 ENGINE STARTING PROCEDURES (ATMB 4.2.1)

Engine starting procedures, also known as start-up clearance, are procedures when a pilot asks the controller for the permission to start the engines. It is being done to save fuel in case there are delays at the aerodrome and the aircraft is not allowed to depart immediately. In case the pilot has not requested departure information before start-up, departure runway and QNH are to be given to the pilot together with the start-up clearance.
If the pilot has received departure information just before start-up request, QNH does not have to be given to the pilot together with the start-up clearance unless it has changed in the meantime.

1. Permission for start-up is given upon the pilot's request. If the QNH and departure runway are not given, there is no readback:

AIR TRAFFIC CONTROLLER	**PILOT**
	9AHGD, request start up.
9AHGD, start-up approved, departure RWY 05, QNH 1012, report ready to taxi	
	Starting up, RWY 05, QNH 1012, wilco, 9AHGD
9AHGD, correct	

2.The example when the start-up cannot be approved due various reasons:

	9AHGD, request start up
9AHGD, unable to approve start up aircraft taxiing behind you.	
9AHGD, negative start up, aircraft taxiing behind you	
	9AHGD, roger

3. If not contacted by the ATC before, the pilot is supposed to ask for start up again:

	9AHGD, request start up
9AHGD, expect start up at 02, QNH 1012	
	Roger, QNH 1012, 9AHGD
9AHGD, correct	

4.The pilot will start up at a given time:

	9AHGD, request start up
9AHGD, start up at 20, QNH 1012	

	To start up at 20, QNH 1012, 9AHGD
9AHGD, correct	

5.Pilot decides when to start the engines after being given the expected time of departure.

	9AHGD, request start up
9AHGD, expect departure at 20, start up at own discretion	
	9AHGD, roger

6. Pilot decides when to start the engines after being given the SLOT time.

	9AHGD, request start up
9AHGD, earliest time of departure according to SLOT at 1002, start up at own discretion	
	SLOT 1002, roger, 9AHGD
9AHGD, correct	

Exercises 11: Start up clearance

Work in pairs. Using the given data, produce start up clearances:

	A/C CALL SIGN	QNH	DEP. SLOT	EXPECTED S/U	START UP TIME
1	BAW678	1008	1055		
2	MAH417	1003		0654	
3	CTN471	1022			1016
4	AZA542	1014		1516	
5	AUA677	1016	2036		
6	ADR3S	998			
7	DLH2CJ	1000			2140
8	PGT632	1001		0821	
9	CES851	1002			2306
10	EZS889	1005	0807		
11	AFR1545	1000	0956		
12	MPH7736	1010		1030	

9.3 PUSH-BACK/POWER-BACK PROCEDURES (ATMB 4.2.1)

When an aircraft is parked nose-in to the terminal building, it has to be pushed backwards by tugs or by its own power before taxiing for departure (power-back). The authorisation to do so, will be obtained from the Tower or Ground controller.

1. Example when pushback is approved

	BAW234, request push back from stand 13
BAW234, pushback approved RWY 30	
	RWY 30, BAW234
BAW234, correct	

2. Example when pushback is approved

	CTN234, stand 23, request start up and push back
CTN234, start up and push back approved	
	CTN234, roger

3. Example when pushback is not approved

	PGT254, stand 23, request push back
PGT254, stand by, PGT254, expect 2-minute delay, B737 taxing behind you	
	PGT254, roger

4. Example when pushback is not approved

	CTN132, request push back
CTN132, negative, hold position, aircraft taxing behind you	
	CTN132, roger

5. Example of power back

	9ABAV, request power back
9ABAV, power back at own discretion RWY 05	
	Roger, RWY 05, 9ABAV
9ABAV, correct	

Ground crew – pilot communication

This exchange of communication is followed by a visual signal to the pilot to indicate that disconnection is completed and all is clear for taxiing.

GROUND CREW	PILOT
	Ground-cockpit, ready for push back
Cockpit-ground, confirm brakes released	
	Brakes released
Confirm brakes set	
	Brakes set
Commencing push back	
Push back completed	
	Stop push back
	Disconnect
Disconnecting, stand by for visual at your right/left	

Towing procedures: Ground - vehicle

ATCO (Ground)	VEHICLE
	Ground, tug 9, request tow Croatia Airbus 319 from maintenance hangar to stand 12
Tug 9, tow approved via Taxiway F to stand 12	
	Apron, Tug 9, request tow DLH B737 from gate 20 to gate 14
Tug 9, proceed via A, hold short of RWY 15	
	Tug 9, to proceed via A, to hold short of RWY 15
Tug 9, hold position	
	Tug 9, holding
Tug 9, stand by	

9.4 ATC CLEARANCE (ATMB 4.1.1.)

ATC clearance is a term often used for ATS route or en-route clearances. It is also used for ATC route clearance given to a pilot before departure (either during taxiing or at the holding point) which confirms the filed flight plan. The pilot should not enter the runway without having received and read back ATC route clearance. ATC clearance consists of the information about destination, route, departure procedure, level and transponder code of the departing aircraft. There are slight differences between IFR and VFR ATC clearances.

9.4.1 IFR ATC CLEARANCE

IFR ATC clearance is given to IFR flights and should consist of the following parts:
Call sign, CLEARED TO <u>destination</u> VIA FLIGHT PLANNED ROUTE, LEVEL, SID, SQUAWK.

An example of ATC clearance to an IFR flight to Split

CTN662, are you ready to copy ATC clearance?	
	CTN662, ready/affirm
CTN662 cleared to Split via flight planned route, FL 130, SID MABAN 2R, squawk 7034	
	Cleared to Split via flight planned route, FL 130, SID MABAN 2R, squawk 7034, CTN662
CTN662, correct	

An example of ATC clearance to an IFR flight to Pula

CTN662, cleared to Pula via flight planned route, FL130, (when airborne) climb straight ahead until passing 3000ft, then turn left cleared to GOLUN, CRE, squawk 7015	
	Cleared to Pula, via flight planned route, FL130, to climb straight ahead and after passing 3000ft to turn left to GOLUN, CRE next, squawk 7015, CTN662.
CTN662, correct	

Exercise 12: ATC clearance

Using the information provided in flight strips produce the ATC clearances for the following IFR flights:

1.

IFR	AT72/M	6521		FL160	
		AZA545		MABAN2C	
	250		LIMC		

C:_____

_____

2.

IFR	A320/M	7073		FL130	
		AUA646		TEBLI2C	
	460	1125	LDDU		

C:_____

_____

3.

IFR	A320/M	6521		FL140	
	450	DLH510		NEDEL2C	
	450		EDDF		

C:_____

_____

4.

IFR	AT43/M	7126		FL130	
	160	CTN623		GOLUN 2R	
	245		LDPL		

C:_____

_____

5.

IFR	A319/M	6506		FL140	
	350	GWI450		NEDEL2C	
	460		EHAM		

C:_____

_____

6.

IFR	A319/M	6342		FL140 RASIN2C	
	350	BAW485			
	460		LHBP		

C:_____

_____

Example of a request for visual departure

	CTN123, Request visual departure direct to SK CTN123, Request visual departure until passing 8000ft
CTN662, advise if able to accept visual departure direct to (point) CTN662, advise if able to accept visual departure until passing 7000ft	
	CTN662, able to accept visual departure, RWY 23

Example of a clearance for visual departure

	CTN662, request visual departure
CTN662, cleared for visual departure RWY 05, (when airborne) turn left/right/direct to (heading/significant point), maintain visual reference until (altitude).	
	Cleared for visual departure RWY 05, (when airborne) turn left/right/direct to (heading/significant point), maintain visual reference until (altitude). CTN662
CTN662, correct	

9.4.2 VFR ATC CLEARANCE

VFR ATC clearance is given to VFR flights and should consist of the following parts
CS, CLEARED VFR FLIGHT TO clearance limit/point/FIR boundary, etc., LEVEL, WHEN AIRBORNE TURN LEFT/RIGHT, PROCEED TO (instructions), SQUAWK

An example of ATC clearance to an VFR flight to Lučko

	9ADDA, VFR flight to Lučko, ready to copy ATC clearance
9ADDA, cleared VFR flight to Lučko, at 1500ft, when airborne turn left, proceed to Lučko, squawk 0015	
	Cleared VFR flight to Lučko, at 1500ft, when airborne to turn left, to proceed to Lučko, , squawk 0015, 9ADDA
9ADDA, correct	

An example of ATC clearance to an VFR flight to Sinj

	9ADDA, VFR flight to Sinj, ready to copy ATC clearance
9ADDA, cleared VFR flight to Sinj, (altitude) 3000ft, when airborne turn right, proceed to S1 point, squawk 0017	
	Cleared VFR flight to Sinj, 3000ft, when airborne to turn right, to proceed to S1 point, squawk 0017, 9ADDA
9ADDA, correct	

An example of ATC clearance to an VFR training flight at LDZA

	9ADKH, for VFR zone Toplana training flight, ready to copy ATC clearance
9ADKH, cleared VFR training flight, when airborne turn left, proceed to Toplana, altitude 2500ft, squawk 0016	
	Cleared VFR training flight, when airborne to turn left, to proceed to Toplana, altitude 2500ft, squawk 0016, 9ADKH

9ADKH, correct

An example of ATC clearance to an VFR flight to flying in the traffic circuit

	9ADKH, for aerodrome traffic circuit training flight, ready to copy ATC clearance
9ADKH, cleared left-hand traffic circuit RWY 05 training flight, altitude 1500 ft, when airborne turn left, join left-hand downwind RWY 05, squawk 0012	
	Cleared left-hand traffic circuit RWY 05 training flight, altitude 1500 ft, when airborne to turn left to join left-hand downwind RWY 05, squawk 0012, 9ADKH
9ADKH, correct	

Exercise 13: ATC clearance

Using the information provided in flight strips produce the ATC clearances for the following VFR flights:

1.

VFR	PA18/L	0005		1500'	
		9ADPA		TGL	
	110	LDZA	LDZA		

C:_____

_____

2.

VFR	C210/L	0015		2500'	
		9ACHD		S1	
	120		LDSS		

C:_____

_____

3.

VFR	C172/L	0010		3000'	
		9ADEG		N1	
	100		LDVA		

C:_____

_____

4.

VFR	PA18/L	0015		2500'	
		9ADRB		S1	
			LDSB		

C:_____

_____

5.

VFR	C172/L	0023		4000’	
		9ADFC		E2	
	100	LDZA	LDOS		

C:_____

_____

6.

VFR	C172/L	0017		3000'	
		9ADEG		W1	
	100		LDRG		

C:_____

_____

9.5 TAXI PROCEDURES (ATMB 4.1.1.2)

Taxi instructions undergo read-back which means that they should be repeated exactly as received since it can greatly reduce the number of runway incursions especially at larger airports with a vast network of taxiways and runways.

Example of taxi instructions to an IFR flight

	CTN662, request taxi (instructions), information C received.
CTN662, taxi via taxiway Alpha to holding point RWY 05.	
	To taxi via taxiway Alpha to holding point RWY 05, CTN662.
CTN662, correct	

To VFR flights, taxi instructions are often given together with a shortened version of departure information (consisting of runway in use, wind and QNH).

Example of taxi instructions to a VFR flight to Lučko

	Zagreb Tower, 9ADDA, general aviation apron, VFR flight to Lučko, request taxi.
9ADDA, Zagreb Tower, taxi to holding point RWY05 via taxiway Bravo, wind 040º/5kt, QNH 1018, correct time 0611	
	To taxi to holding point RWY 05 via taxiway Bravo, QNH 1018, 9ADDA
9ADDA, correct	

Example of taxi instructions to a VFR flight to enter the RWY at intersection C

9ACDH, taxi via TWY B, C to holding point RWY 05, wind 070º/10kt, QNH 1009	
	To taxi via TWY B, C to holding point RWY 05, QNH 1009, 9ACDH
9ACDH, correct	

Example of taxi instructions to a VFR flight to at LDZA for RWY 23

	9AHGD, starting up, request taxi instructions
9AHGD taxi to holding point RWY 23, wind 220º/16kt	
	To taxi to holding point RWY 23, 9AHGD
9AHGD, correct	

The pilot may request to depart from the intersection and not the runway threshold

	CTN622, request departure from RWY 05, intersection B
CTN622, approved, taxi to holding point RWY 05, intersection B	
	To taxi to holding point RWY 05, intersection B CTN622

CTN622, negative, taxi to holding point RWY 05, intersection A	
	Roger, to taxi to holding point RWY 05, intersection A, CTN622.

Example of requesting the aircraft to hold position

	9AUWX, request taxi clearance
9AUWX, taxi via TWY A to holding point RWY 23, report approaching TWY B	
	To taxi via TWY A to holding point RWY 23, wilco, 9A UWX.
9AUWX, correct.	
	9AUWX, approaching TWY B.
9AUWX, hold position.	
	Holding (position), 9A UWX.
9AUWX, correct.	

	9AUWX, approaching TWY B
9AUWX, roger, continue taxiing	
	9AUWX, roger

	9ABAV, request TWY B

9ABAV, TWY B approved, taxi via TWY B to holding point B, RWY 23	
	To taxi via TWY B to holding point RWY 23, 9ABAV
9ABAV, correct	

Instruction to the pilot not to enter a specified taxiway or runway.

9ADDC, hold short of TWY B	
	Holding short of TWY B, 9ADDC
9ADDC, correct	

Instruction to the pilot to allow a certain aircraft to overtake it.

9A BAV, give way to Airbus 319 passing ahead of you	
	9ABAV, giving way to Airbus 319.
9ABAV, roger	
	9ABAV, traffic/Airbus 319 in sight
9ABAV, roger	

An example of after landing instructions to vacate the runway. It is often requested that the pilot reports when s/he has left the runway thus letting the controller know that the runway is clear for other traffic to land or take off.

	CTN662, request taxi instructions
CTN662, vacate the runway via taxiway Delta, taxi via taxiway Foxtrot to the apron, report runway vacated	
	Via TWY Delta and Foxtrot to the apron, wilco, CTN662
CTN662, correct	
	CTN662, runway vacated
CTN662, roger	

Expediting clearing the runway

CTN662, expedite vacating the runway via taxiway Delta, traffic on final RWY 05, report runway vacated

	Expediting vacating via TWY Delta, wilco, CTN662
CTN662 correct	

Examples of backtracking or backtaxiing instructions

CTN662, backtrack RWY 05, expedite vacating the runway via taxiway Charlie, traffic on final RWY 05, report runway vacated	
	To backtrack RWY 05 and to expedite vacating the runway via taxiway Charlie, wilco, CTN662
CTN662 correct	
	CTN662, runway vacated
CTN662, roger	

	CTN123, request backtrack RWY 11
CTN123, backtrack RWY 11 approved	
	Backtracking RWY 11, CTN123
CTN123, correct	

	CTN 123, request backtrack RWY 11
CTN123, backtrack RWY 11	
	To backtrack RWY 11, CTN123
CTN123, correct	

Examples of various taxi instructions

CTN123, expedite taxi (reason)	
	Expediting, CTN123.

CTN123, caution taxi slower (reason)	
	Slowing down, CTN123.

CTN123, vacate runway via taxiway A	
	Vacating runway via taxiway A, CTN123

CTN123, give way to Dash 80 entering TWY C.	
	CTN123, Giving way Dash 80 entering TWY C

CTN123, Taxi/turn right at the far end.

CTN123, Take/turn first/second left/right

CTN123, Taxi carefully/ with caution

CTN123, Follow (description of other aircraft or vehicle)

CTN123, Taxi into holding bay

9.6 LINE UP (ATMB 4.1.1.3.)

Line-up is an instruction given to an aircraft to enter the runway, align with the runway centreline, do all the necessary checks and wait for take-off clearance. Line-up clearance can be given when the aircraft is at the holding point or while it is still taxiing towards the holding point. The purpose of line-up instruction is to expedite the flow of traffic.

	9ADDC, at holding point RWY 23 ready for departure
9ADDC, line up (and wait) RWY 05.	
	Lining up RWY 05, 9ADDC.
9ADDC, correct	

	9ADDC, approaching holding point RWY 05
(9ADDC, are you ready for immediate departure)	
	9ADDC, ready (or affirm).
9ADDC, line up RWY 05 and be ready for immediate departure	
	Lining up RWY 05, 9ADDC
9ADDC, correct	

9.6.1 MULTIPLE LINE UPS ON THE SAME RUNWAY

When multiple runway/intersection departures are given, runway number is to be uttered. Line-up instructions may be issued to more than one aircraft at different points on the same runway, taking into account that the intersection take-off criteria shall be complied with and conditions of application fulfilled according to local operating instructions.

9ADDC, line up RWY 23	
	Lining up RWY 23, 9ADDC
9ADDC, correct	

9ADDC, line up and wait RWY 23, intersection C	
	Lining up RWY 23, intersection C, 9ADDC
9ADDC, correct	

9.6.2 CONDITIONAL LINE-UP CLEARANCE

Conditional clearance affecting the active runways may be given only when the arriving aircraft is seen both by the controller and the pilot of the departing aircraft and after the departing aircraft has correctly identified the arriving aircraft on which the conditional clearance is based. So, before uttering the conditional line-up clearance, a controller shall provide the pilot of a departing aircraft with traffic information (aircraft type and position).

CTN662, traffic is Airbus 319 on final RWY 05. Report traffic in sight.	
	CTN662, traffic in sight.
CTN662, roger, behind Airbus 319 line up behind	
	Behind Airbus 319 to line up behind, CTN662.
CTN662, correct	
AFTER THE AIRCRAFT HAS VACATED THE RUNWAY	
CTN662, cleared for take-off RWY 05, wind 060º/5kt	
	Cleared for take-off RWY 05, CTN662.
CTN662, correct	

9.7 TAKE OFF CLEARANCE (ATMB 4.1.1.3)

An aircraft is not allowed do take off without the take-off clearance. Take off clearance can be given to the aircraft during taxiing, at the holding point or on the line up position. It should be followed by the information on wind direction and velocity. When visibility is good, the controller will also give the aircraft airborne time.

9ADDC, cleared for take-off RWY 23, wind 220º/14kt	
	Cleared for take-off RWY 23, 9ADDC
9ADDC, correct.	
9ADDC, airborne at 23	

In poor visibility (applicable for Low Visibility operations) the controller will ask the pilot to report airborne time.

9ADDC, cleared for take-off RWY23, wind 220º/14kt, report airborne	
	Cleared for take-off RWY 23, wilco 9ADDC
9ADDC, correct.	
	9ADDC, airborne at 23
9ADDC, roger	

There are situations when the pilot has been given the take-off clearance and has entered the runway in use but has not commenced the take off. Then, the controller is to determine the pilot's intentions:

9ADDC, cleared for take-off RWY 05, wind 190º/20kt	
	Cleared for take-off RWY 05, 9ADDC
9ADDC, correct	
THE AIRCRAFT IS NOT MOVING	
9ADDC, take off immediately or vacate the RWY	
	Taking off RWY 05, 9ADDC
9ADDC, roger	

9ADDC, cleared for take-off, wind 190º/20kt	
	Cleared for take-off RWY 05, 9ADDC
9ADDC, correct	

THE AIRCRAFT IS NOT MOVING	
9ADDC, take off immediately or vacate the RWY	
	Vacating the RWY, 9ADDC
9ADDC, roger	

CTN662, expedite departure, approaching traffic on 4-mile-final RWY 05	
	Taking off RWY 05, CTN662
CTN662, roger	

CTN662, take off immediately or vacate the RWY via taxiway Bravo	
	Vacating the runway via taxiway B, CTN662
CTN662, roger	

In situations when the pilot has been given the take-off clearance, but is still at the holding point and is not entering the runway in use to commence the take-off, the controller is to determine the pilot's intentions:

	CTN662, holding point RWY 23, ready for departure
CTN662, cleared for take-off RWY 23, wind 210º/12kt.	
THE AIRCRAFT IS NOT MOVING	
CTN662, take off immediately or hold short of RWY23.	
	Holding short RWY 23, CTN662.
CTN662, correct	

	CTN662, holding point RWY 23, ready for departure.
CTN662, cleared for take-off RWY 23, wind 210º/12kt.	
	Cleared for take-off RWY 23, CTN622
CTN622, correct	

CTN662, take off immediately or hold short of RWY.	
	Taking off RWY 23, CTN662.
CTN662, roger	

9ADDC, hold short of RWY 23.	
	Holding short RWY 23, 9ADDC.
9ADDC, roger	

9.7.1 CANCELLATION OF TAKE-OFF CLEARANCE AT THE HOLDING POINT

The take-off clearance can be cancelled on the line up position or on the runway holding point. In situations when the pilot has been given the take-off clearance but has not yet started the take-off roll and there is some obstacle on the runway, the controller will attempt to stop the pilot/aircraft from taking off:

CTN662, hold position, cancel take off, I say again, cancel take off clearance, vehicle on the runway	
	Holding position, CTN662
CTN662 correct.	

9.7.2 REJECTING THE TAKE OFF CLEARANCE DURING THE TAKE OFF RUN

In situations when the pilot has been given the take-off clearance and has started the take-off roll and there is some obstacle on the runway, the controller will attempt to stop the pilot/aircraft from taking off:

CTN662, stop immediately, CTN662, stop immediately.	
	Stopping, CTN662
CTN662, correct.	

9.8 REPORTING AIRBORNE

In case the visibility is good the controller will provide the pilot with the airborne time. If the visibility is low, the controller will ask the pilot to report airborne time.

9ADDC, report airborne.	
	9ADDC, wilco
	9ADDC, airborne at 25
9ADDC, roger, contact Zagreb Radar on 120,7	
	120,7, 9ADDC
9ADDC, correct.	

9ADDC, cleared for take-off, wind 220º/13kt, report airborne	
	Cleared for take-off, wilco, 9ADDC
9ADDC, correct	
	9ADDC, airborne at 27.
9ADDC, roger.	
9ADDC, report leaving the control zone	
	9ADDC, wilco
	9ADDC, leaving the control zone.
9ADDC, roger, contact Zagreb Radar on 118,5	
	118,5, 9ADDC

Exercise 14: Runway clearances

Unjumble the sentences and write your sentences in the space provided and connect the sentences with the pictures:

1. Immediate/Coastal 44/be ready/line up/

   _____

2. Wind 340^{o}, 3 kts/cleared/RWY 36/for/ Qantas 524/take-off

   _____

3. and/wait/line/Pacific 19/up/RWY 36

   _____

4. will/Qantas61/737/ RWY 36/cleared/on crossing runway/for/take-off/landing/hold short

   _____

   _____

5. 311/hold/Ibisair/position

   _____

6. Advise/available/required/Qantas 10/if/backtrack

   _____

7. Acknowledge/immediately/Jetstar 418/stop/immediately/I say again/stop

   _____

8. Short final/Qantas 86/behind/line up/RWY 36/behind/on/the Qantas 767

   _____

   _____

9. Eastern101/information/for/near TWY Golf/birds/your/north/of RWY 36/there are

   _____

   _____

9.9 AERODROME CONTROL - TRAFFIC INFORMATION (ATMB 4.1.1.4.)

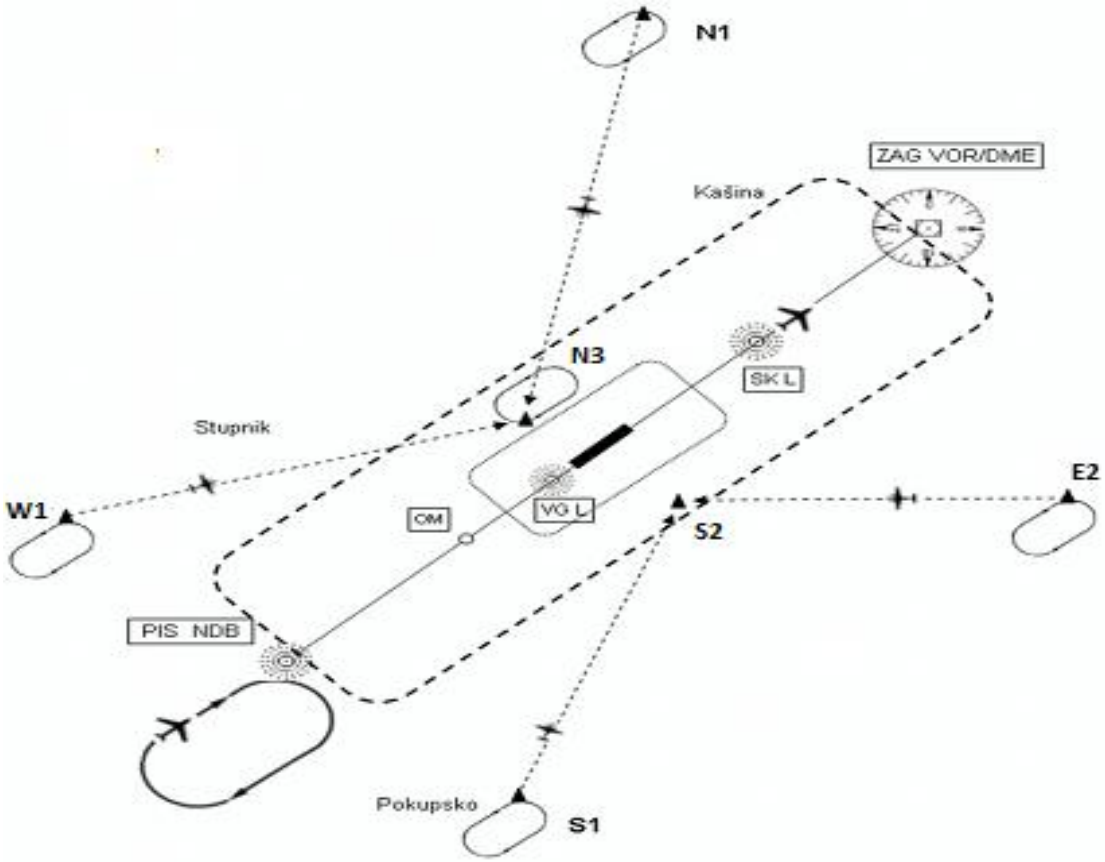
Traffic information shall be passed in order to arrange sequencing, to avoid unnecessary delay and to manage safety issues evaluating time most efficiently.
It shall consist of:

1. the call sign of the aircraft being addressed,
2. the aircraft type,
3. the aircraft position (according to the last pilot's report and ATC clearance)
4. the aircraft level (when known).

The pilot can provide the following answers to acknowledge the receipt of the traffic information:

	9ADDA, looking out.
	9ADDA, traffic in sight.
	9ADDA, negative contact.
9ADDA, clear of traffic.	

Picture 2: Positions of various aircraft in CTR Zagreb [12]



Exercise 15: Traffic information

Look at Picture 2 and draw the following aircraft positions on the map according to the traffic information given:

1. 9ADML, traffic is Piper 28 from Lučko to N3 point at 2000 ft. (Report traffic in sight)
2. 9ADKL, traffic is C150 just departing (from) RWY 05, proceeding to N1 point, climbing to 2000 ft (Report traffic in sight)
3. 9ADLP, traffic is Cessna 172 just airborne and joining left-hand traffic circuit RWY 05
4. 9ADMS, traffic is Cessna 150 just performing touch-and-go RWY05 and about to join left-hand traffic circuit RWY 05
5. 9ADDK, traffic is C150 on right-hand downwind RWY 05 at 2000 ft

9.10 GO AROUND (ATMB 4.1.1.5.)

A go-around is an aborted landing of an aircraft which is on final approach. If for some reason the pilot decides not to land, the pilot can simply fly back up to the traffic circuit altitude, and complete another circuit i.e., go around again. The term go-around is still used even for modern airliners, though they may not use traditional circuit patterns for landing. The manoeuvre is also known as a “Balked Landing”. The go-around procedure may be initiated either by the air traffic controller or by the pilot in command of the aircraft. The controller may instruct the pilot to go around if there is an aircraft, vehicle or object on the runway (runway incursion) or some other unsafe condition. In both controlled and uncontrolled fields, the pilot in command may decide to go around at any time, for example if the aircraft is not lined up or configured properly for a safe landing; an aircraft, vehicle or other object has not cleared the runway; no landing clearance was received (in a controlled field); the landing gear is not properly extended; a dangerous meteorological condition is experienced on final approach (e.g., poor visibility, excessive cross-winds, etc.); excessive energy (too high or too fast); or some other unsafe condition is detected. IFR flights refer to "executing the missed approach" rather than a (VFR) go around.

Example of a go-around initiated by the controller to VFR flight

9ADDB, go around, (not below 1000 ft), traffic on the RWY, report left-hand downwind RWY 05	
	Going around, (not below 1000 ft) wilco, 9ADDB
9ADDB, correct	

Example of a go-around initiated by the controller to an IFR flight

CTN622, go around and follow missed approach procedure.	
	Going around to follow missed approach procedure, CTN622.
CTN622, correct, contact Zagreb Radar 120,7	
	120,7, CTN622
CTN622, correct	

The pilot himself saw something on the runway or due to some other reason has decided to go around:

	9ABBC, going around
9ABBC, roger, report right-hand downwind RWY 14.	
	9ABBC, wilco

9.11 LOW APPROACH (ATMB 4.1.1.5.)

Low approach is an approach along or parallel to a runway descending to a specified minimum level. It is some sort of a training manoeuvre when aircraft are flying along or parallel to a runway with its gear retracted intentionally. Law approach clearance should be accompanied with the clearance instructing the pilot what to do after low approach. That clearance may be given before or after the low approach clearance.
Low approach clearance shall consist of the following elements:

1. runway in use
2. wind
3. “not below altitude”
4. QNH

An example of a low approach clearance given to a VFR flight.

	9ADDA, request low approach RWY 09 (for training)
9ADDA, cleared low approach RWY 05, wind 120º/6kt, not below 1000 feet, QNH 1009	
	Cleared low approach RWY 09, not below 1000 feet, QNH 1009, 9ADDA

9ADDA, correct, after low approach, turn right, proceed to E2 point, climb to 3000 ft, (squawk 1001)	
	After low approach to turn right, to proceed to E2 point, to climb to 3000 ft, (squawk 1001), 9ADDA
9ADDA, correct	
	9ADDA, low approach completed.
9ADDA, roger, report passing 2000ft	
	9ADDA, wilco.

9.12 LOW PASS (ATMB 4.1.1.5.)

In case of unsafe gear indication (nose, main, left or right landing gear), the pilot may request to fly past the control tower or some other observation point for the purpose of visual inspection from the ground. Low pass is to be executed not below a certain level depending on the altitude of the observation point. Law pass clearance should be accompanied with the clearance instructing the pilot what to do after low pass as is the case with low approach. Reasons given for executing low pass may be unsafe indication of the landing gear.
Low pass clearance shall consist of the following elements:

1. runway in use
2. wind
3. “not below altitude”
4. QNH

An example of a low pass clearance given to a VFR flight.

	9ADAS, request low pass due unsafe indication of the nose wheel
9ADAS, cleared for low pass RWY 23, wind 220º/12kt not below 500 feet, QNH 1010.	
	Cleared for low pass RWY 23, not below 500 ft, QNH 1010, 9ADAS.
9ADAS, correct, after low pass turn right, join right-hand downwind RWY 23.	

	After low pass to turn right, to join right-hand downwind RWY 23, 9ADAS.
9ADAS, correct	

When passing the tower, the controller can provide the pilot with the information on the state of landing gear. Since the controller cannot guarantee that what he sees is 100% true, s/he is to use phrases like ”seems to, doesn’t seem to, appears to, doesn’t appear to” when describing the state of the landing gear:

CTN423, landing gear appears up
CTN423, nose gear appears down
CTN423, nose gear seems jammed
CTN423, landing gear doesn’t appear up
CTN423, landing gear doesn’t seem down

9.13 TOUCH-AND-GO and STOP-AND-GO (ATMB 4.1.1.5.)

Touch-and-go is a manoeuvre in which an aircraft touches the ground as in landing and immediately takes off again. It is common when learning to fly a fixed-wing aircraft. It involves landing on a runway and taking off again without coming to a full stop. Usually the pilot then circles the airport in a traffic circuit and repeats the manoeuvre. This allows many landings to be practiced in a short time. If the pilot brings the aircraft to a full stop before taking off again, then it is known as "stop-and-go".

Touch-and-go landings are also crucial when a plane lands at a point on the runway where there is not enough space to come to a complete stop, but has enough space to accelerate and take off again to carry out a go-around. So, when a pilot wishes to land and take off again immediately for training purposes, thus reducing the time spent on the ground, s/he will ask for touch-and-go.

Example of a touch-and-go clearance

	9ADKH, on final RWY 05, for touch-and-go (training)
9ADKH, cleared for touch-and-go RWY 05, wind 060º/5kt	
	Cleared for touch-and-go RWY 05, 9ADKH
9ADKH, correct	

As is the case with low approach and low pass clearances, touch-and-go clearance should also be accompanied with the instruction to the pilot what to do afterwards for the simple reason that the aircraft cannot stay still in the air. There are two versions:

Example of a longer version of "after touch-and-go" instruction

9ADKH, correct, after touch-and-go turn right, join right-hand traffic circuit RWY 05, report downwind.	
	After touch-and-go to turn right to join right-hand traffic circuit RWY 05, wilco, 9ADKH
9ADKH, correct	

Example of a shorter version of "after touch-and-go" instruction

9ADKH, after touch-and-go turn right, join right-hand downwind RWY 05	
	After touch-and-go to turn right, to join right-hand downwind RWY 05, 9ADKH.
9ADKH, correct	

9.14 FULL STOP LANDING (ATMB 4.1.1.6.)

After a number of touch-and-gos the pilot may ask for a full stop landing or in case the traffic situation does not permit another execution of touch-and-go, the controller shall issue the instruction for the full stop landing. The information that the pilot should make a full stop landing should be accompanied with the clearance to land because "make full stop landing" is not a clearance but just a piece of information that no more touch-and-goes are available.

Example of full stop landing being given after a series of touch-and-gos

	9ADDA, request another touch-and-go for training.
9ADDA, unable to approve touch-and-go, make full stop landing, cleared to land RWY 05, wind 050º/4kt	
9ADDA, correct	

Example of full stop landing being given after a series of touch-and-gos

9ADDA, negative (due (to) traffic), make full stop landing, cleared to land RWY 05, wind 050º/4kt.	
	RWY 05, cleared to land for full stop RWY05, 9ADDA.
9ADDA, correct	

9.15 DELAYING ACTIONS

For the purpose of maintaining the safe and orderly flow of traffic in the traffic circuit, the controller shall sometimes use delaying actions to separate traffic. The pilot can be asked to orbit at a certain position, to make one orbit or one 360 or to extend downwind.

9.15.1 MAKING 360/AN ORBIT

When making an orbit the aircraft will lose 2 minutes. The controller needs to specify whether the orbit should be made to the left or to the right and which will depend on the position in the traffic circuit. It is preferable to make orbits away from the runway in use. Upon the completion, the pilot shall inform the controller that the orbit has been completed.

9ADDA, make a three sixty right, (report three sixty completed).	
	One three sixty right, (wilco), 9ADDA.
9ADDA, correct.	
	9ADDA, orbit completed.
9ADDA, roger, continue approach, report final.	
	9ADDA, roger, wilco.

9.15.2 ORBITING

The controller can ask the pilot to orbit at a certain position, which means that the aircraft will be orbiting (doing orbits, each lasting two minutes) until the controller asks the pilot to stop.

Example of orbiting in downwind position

9ADDA, orbit right at position left-hand downwind RWY 05.	
	To orbit right at L-H downwind RWY 05, 9ADDA.
9ADDA, stop orbiting, continue approach, report final RWY 05.	
	Stopping, to continue approach, wilco, 9ADDA.
9ADDA correct.	

9ADDA, orbit left at present position.	
	Orbiting left at present position, 9ADDA.
9ADDA, correct.	

Example of orbiting over a point

9ADDA, you are number 2 for landing, orbit over S point.	
	Number 3 for landing, to orbit over S point, 9ADDA.
9ADDA, correct.	

Example of orbiting over a point

9ADDA, hold over S2 until 25.	
	To hold over S2 until 25, 9ADDA.
9ADDA, correct.	

9.15.3 EXTENDING DOWNWIND

The pilot can be asked to extend downwind which means that the downwind section of the traffic circuit will be prolonged and the aircraft will turn base later than usual, thus making the final leg of the traffic circuit longer as well. The controller shall ask the pilot to turn base when the adequate separation has been established.

9ADDA extend left-hand downwind RWY 05, (call you back for turning to base/final)	
	Extending left-hand downwind RWY 05, (roger), 9ADDA
9ADDA, correct (expect onward instructions shortly)	

9.16 FLYING IN THE TRAFFIC CIRCUIT/PATTERN/ZONE (ATMB 4.1.1.4.)

Controlled airspace is an airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification.
Airway is a control area or portion thereof established in the form of a corridor equipped with radio navigational aids. (5 NM wide from the central line to each side).
Control zone (CTR) is a controlled airspace extending upwards from the surface of the earth to a specified upper limit.
Terminal control area (TMA) is a control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.
At uncontrolled airports and in CTR Croatian is spoken to VFR flights, and in all other situation English is spoken, i.e. English phraseology.

Example of a VFR flight entering the control zone and joining instructions for RWY 05

	Zagreb Tower, 9ADDA, S1 point, 2000 ft, request joining instructions for landing.
9ADDA, Zagreb Tower, roger, proceed to S2 point, 2000ft, RWY 05, wind 120º/12kt, QNH 997	
	To proceed to S2 point, 2000ft, RWY 05, QNH 997, 9ADDA

9ADDA, correct	
	9ADDA, S2 point, 2000ft
9ADDA, roger, join right-hand pattern RWY 05, 1500ft, report downwind	
	To join right-hand pattern for RWY 05, 1500ft, wilco, 9ADDA.
9ADDA, correct	
	9ADDA, right-hand downwind (for) RWY 05
9ADDA, roger, number 1.	

Example of joining instructions for RWY23

9ADDA, join left-hand downwind RWY 23, wind 190º/14kt, QNH 1013.	
	To join left-hand downwind, RWY 23, QNH 1010, 9ADDA
9ADDA, negative, QNH 1013.	
	QNH 1013, 9ADDA.
9ADDA, correct.	
	9ADDA, downwind RWY 23
9ADDA, roger, report turning base	
	9ADDA, wilco. 9ADDA, turning base
9ADDA, roger, report turning final	
	9ADDA, wilco 9ADDA, turning final

Exercise 16: VFR TRAFFIC CIRCUIT

Produce initial calls and joining instruction for the following aircraft:

1.

VFR	PA18/L	0005		LDZL 1500'	
		9ADPA		1 TGL AT LDZA 3000' S1	
	110	LDZL	LDSS		

2.

VFR	C210/L	0009		2500'	
		9ADEG		S1	
	120	LDZA	LDSS		

3.

VFR	C172/L	0006		2500'	
		9ADHV		N1	
	100	LDZA	LDVA		

4.

VFR	C172/L	0001		1500	
		9ADDA		TGL	
		LDZA	LDZA		

5.

VFR	C150/L			2000'	
		9ADAB		W1	
		LDRG	LDZA		

6.

VFR	C210/L	0005		3000'	
		9AREG		E2	
		LDZA	LDOS		

7.

VFR		0015		2500' N1	
		9ACDH		L/A at LDZA	
		LDVA	LDVA		

Exercise 17: IFR FLIGHTS

Produce complete exchange of messages (initial call, departure information, ATC clearance, take off clearance or joining instructions for the following flights:

1.

IFR	F70/M	6543		FL140	
	280	AUA333		MACEL2C	
	380		LOWW		

2.

IFR	A320/M	7073		FL130	
		SWR646		PODET2C	
	460	LDZA	LSZH		

3.

IFR	A320/M	6535		FL140	
	450	BAW450		PODET2C	
	450	LDZA	EGLL		

4.

IFR	AT43/M	7076		FL130	
	160	CTN369		RUDIK2C	
	245	LDZA	LDSP		

5.

IFR	A319/M			ETO/PIS	
		AFR698		1512	
	460	LFPG	LDZA		

6.

IFR	A319/M	LDZA		ETO/PIS	
		AZA123		1530	
	465	LIRF	LDZA		

7.

IFR	AT72/M	6521		FL160	
		AZA545		MABAN2C	
	250	LDZA	LIMC		

Here is a combination of joining instructions and traffic information to traffic No. 2 regarding traffic No. 1:
There is an aircraft (A320) on final RWY 05, which is supposed to land first, and there is another aircraft (9ADKH) in the traffic circuit, which is supposed to follow number 1 and land after it.

	Zagreb TOWER, 9ADKH departed from Lučko, maintaining 1500 ft, for low approach at Zagreb (request joining instructions).
9ADKH, Zagreb Tower, RWY in use 05, wind 060/5kt, QNH 1018, join left-hand traffic circuit RWY 05, at 1500 ft, report downwind.	
	RWY 05, QNH 1018, to join left-hand traffic circuit RWY 05, at 1500 ft, wilco, 9ADKH.
9ADKH, correct.	
	9ADKH left-hand downwind RWY 05, 1500ft.
9ADKH, traffic/number one is A320 just passing OM RWY 05, report traffic in sight.	
	9ADKH, traffic in sight.
9ADKH, roger, number two, follow A320, report on final, caution wake turbulence.	
	Number two, wilco, roger, 9ADKH.
9ADKH, correct.	
	9ADKH, on final RWY 05.
9ADKH, cleared low approach RWY 05, wind 065º/7kt, not below 1000 ft, QNH 1018	
	Cleared low approach RWY 05, not below 1000 ft, QNH 1018, 9ADKH
9ADKH, correct, after low approach, turn left proceed to Lučko, climb to 1500ft, report over N3 point	
	After low approach to turn left to proceed to Lučko, to climb to 1500 ft, wilco, 9ADKH
9ADKH correct	

9.17 JOINING INSTRUCTIONS, FINAL APPROACH AND LANDING (ATMB 4.1.1.5.)

Example of arriving IFR traffic instructions

	Zagreb Tower, CTN662, ILS established RWY 05.
CTN662, Zagreb Tower, cleared to land RWY05, wind 060/7kt.	
	Cleared to land RWY05, CTN662.
CTN662, correct.	

Phraseology to be used on final to an IFR flight making visual approach

	CTN423, (on) final.
CTN423, roger, do you have RWY in sight?	
	CTN423, affirm.
CTN423, cleared to land RWY 23, wind 190º/17k.t	
	Cleared to land RWY 23, CTN423.
CTN423, correct	

Phraseology to be used on final to an arriving VFR flight

	Zagreb Tower, 9ADDA, 7NM NE of the field at 1500ft, for landing.
9ADDA, Zagreb Tower, cleared for straight in approach RWY 23, wind 220º/5, QNH 1009	
	Cleared for straight in approach RWY 23, QNH 1009, 9ADDA

In case the RWY is occupied and/or landing clearance will not be issued during the first contact, the pilot on an instrument approach shall be instructed as follows:

	Zagreb Tower, CTN662, ILS established RWY 05
CTN662, Zagreb Tower, (roger), continue approach, report passing outer marker	
	Continuing approach, wilco, CTN662
	CTN662, passing outer marker

CTN662 cleared to land, wind 060º/7kt	
	Cleared to land, CTN662
CTN662 correct	

	Zagreb Tower, CTN662, ILS established
CTN662, Zagreb Tower, continue approach, report passing outer marker	
	Continuing approach, wilco, CTN662
	CTN662, passing outer marker
CTN662, continue approach, expect landing clearance shortly, (landed) aircraft still on the RWY	
	Continuing approach, roger, CTN662
CTN662 cleared to land, wind 060/7kt	
	Cleared to land, CTN662
CTN662 correct	

In case the RWY is occupied and landing clearance cannot be issued, the pilot on a visual approach shall be instructed as follows:

	Zagreb Tower, CTN662, on final RWY05
CTN662, Zagreb Tower, continue approach, expect landing clearance shortly, RWY occupied by landing aircraft	
	Continuing approach, roger, CTN662
CTN662, cleared to land, wind 060/7kt	
	Cleared to land, CTN662
CTN662, correct	

VFR FLIGHT

	Zagreb Tower, 9ADKH departed from Lučko to Zagreb, maintaining 1500 ft, for landing (request joining instructions).
9ADKH, Zagreb Tower, RWY in use 05, wind 060º/5kt, QNH 1018, join left-hand traffic circuit RWY 05, report downwind, at 1500ft	

	RWY 05, QNH 1018, to join left-hand downwind RWY 05, wilco, 1500ft, 9ADKH
9ADKH, correct	

When there is no other traffic or there is sufficient time before another approaching traffic:

	Zagreb Tower, 9ADKH departed from Lučko to Zagreb, maintaining 1500ft, for landing.
9ADKH, Zagreb Tower, join left-hand base RWY 05, wind 060º/5kt, QNH 1018.	
	To join left-hand base RWY 05, QNH 1018, 9ADKH.
9ADKH correct.	
	9ADKH on left-hand base RWY05
9ADKH roger, cleared to land RWY05, wind 060º/5kt	
	Cleared to land, 9ADKH
9ADKH correct	

Instructions to arriving traffic NDB Approach RWY 23 (Initial/intermediate fix /holding ZAG VOR)

	Zagreb Tower, CTN662, 7 miles ZAG DME/inbound SK
CTN662, Zagreb Tower, continue approach, report SK inbound/final RWY 23.	
	CTN662 wilco
	CTN662 passing SK
CTN662 cleared to land RWY 23 wind 200º/10kt	
	Cleared to land RWY 23, CTN662
CTN662 correct	

Instructions to arriving traffic for LZ Approach RWY 23 (Initial/intermediate fix /holding ZAG VOR)

	Zagreb Tower, CTN662, inbound SK.
CTN662, Zagreb Tower, roger, report SK.	
	CTN662 wilco
	CTN662, passing SK.

CTN662, roger continue approach, expect landing clearance shortly, runway still occupied	
	Continuing approach, roger, CTN662
CTN662, cleared to land RWY 23, wind 195/11 kt	
	Cleared to land RWY 23, CTN662
CTN662 correct	

Exercise 18: Preparation for "Aerodrome simulator"

There are 7 flight strips for 7 various aircraft flying in CTR Zagreb. Complete the communication while these aircraft are flying simultaneously in CTR Zagreb. Students are grouped into pairs, one being an air traffic controller and the other one pilot. Each pair of students handles one aircraft (reproduces the communication).

1. **WHITE AIRCRAFT**

IFR				ETO/PIS	
		SWR 123		10:13	
	400	LSZH	LDZA		

INITIAL CALL

P: _____

C: _____

P: _____

C: _____

LANDING CLEARANCE

P: _____

C: _____

P: _____

C: _____

VACATING THE RUNWAY

C: _____

P: _____

C: _____

2. BLACK AIRCRAFT

VFR	C172/L	0001		1500'	
		9ADAP		TGL	
	100	LDZA	LDZA		

TAXI INSTRUCTIONS

P: _____

C: _____

_____

P: _____

C: _____

ATC CLEARANCE

P: _____

C: _____

_____

P: _____

C: _____

TAKE OFF CLEARANCE

P: _____

C: _____

P: _____

C: _____

IN THE TRAFFIC CIRCUIT

P: _____

C: _____

P: _____

C: _____

WHAT TO DO AFTER TOUCH AND GO

P: _____

C: _____

P: _____

C: _____

T/G CLEARANCE

P: _____

C: _____

P: _____

C: _____

3. BLUE AIRCRAFT

VFR	C172/L	0010		LDZL 1500' 10:05 1LA AT LDZA 3000' N	
		9ABBC			
	100	LDZL	LDOS		

INITIAL CALL

P: _____

C: _____

_____

P: _____

C: _____

TRAFFIC CIRCUIT JOINING INSTUCTIONS

P: _____

C: _____

P: _____

C: _____

WHAT TO DO AFTER:

P: _____

C: _____

P: _____

C: _____

L/A CLEARANCE

P: _____

C: _____

P: _____

C: _____

TRANSFER OF CONTROL

C: _____

P: _____

P: _____

C: _____

P: _____

C: _____

4. RED AIRCRAFT

IFR	A320/M	6554		FL140	
	380	CTN 416		OBUTI 1H	
	450	LDZA	EDDF		

INITIAL CALL/DEPARETURE INFORMATION

P: _____

C: _____

P: _____

C: _____

START UP

P: _____

C: _____

P: _____

C: _____

TAXI INSTRUCTIONS

P: _____

C: _____

P: _____

C: _____

ATC CLEARANCE

P: _____

C: _____

P: _____

C: _____

TAKE OFF CLEARANCE

P: _____

C: _____

P: _____

C: _____

TRANSFER OF CONTROL

C: _____

P: _____

C: _____

5. GREEN AIRCRAFT

VFR	C150/L			2000'
		9ACDH		N1 AT 10:09
	100	LDVA	LDZA	

INITIAL CALL

P: _____

C: _____

_____

P: _____

C: _____

TRAFFIC CIRCUIT JOINING INSTRUCTIONS

P: _____

C: _____

P: _____

C: _____

IN THE TRAFFIC CIRCUIT

P: _____

C: _____

P: _____

C: _____

LANDING CLEARANCE

P: _____

C: _____

P: _____

C: _____

VACATING THE RUNWAY

C: _____

P: _____

C: _____

6. YELLOW AIRCRAFT

VFR	PA18/L	0015		2500'
		9ADBR		S1
	110	LDZA	LDSS	

TAXI INSTRUCTIONS

P: _____

C: _____

_____

P: _____

C: _____

ATC CLEARANCE

P: _____

C: _____

_____

P: _____

C: _____

TAKE OFF CLEARANCE

P: _____

C: _____

_____

P: _____

C: _____

TRANSFER OF CONTROL

C: _____

P: _____

P: _____

C: _____

P: _____

C: _____

7. MULTIPLE-COLOURED AIRCRAFT

VFR	C172/L			2000'
		9ADEF		S1 AT 10:10
	110	LDSP	LDZA	

INITIAL CALL

P: _____

C: _____

_____

P: _____

C: _____

TRAFFIC CIRCUIT JOINING INSTRUCTIONS

P: _____

C: _____

P: _____

C: _____

IN THE TRAFFIC CIRCUIT

P: _____

C: _____

P: _____

C: _____

LANDING CLEARANCE

P: _____

C: _____

P: _____

C: _____

VACATING THE RUNWAY

C: _____

P: _____

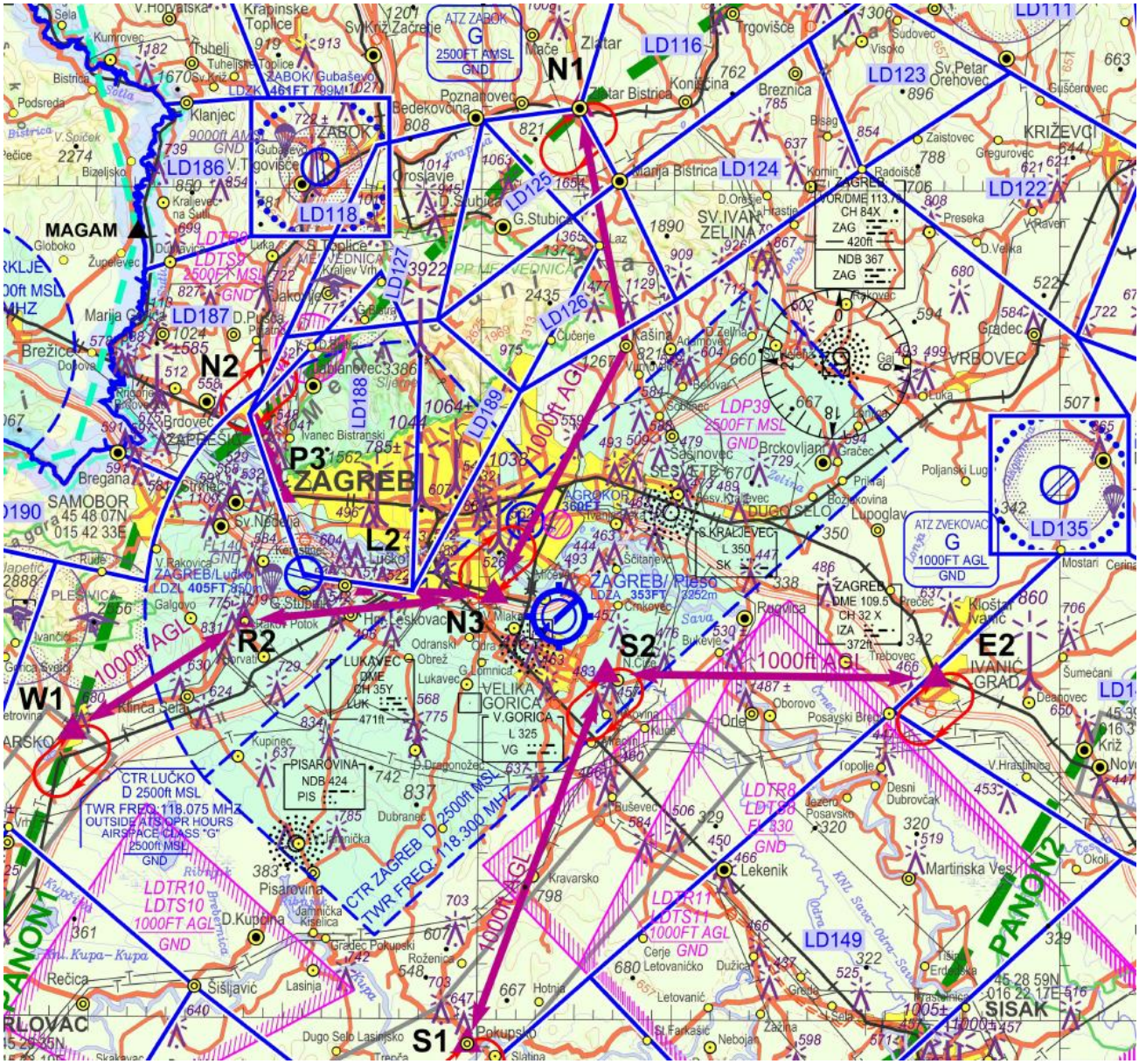
C: _____

10 LITERATURE

[1] Basic ATCO training plan and program – training course, Issue: 1, Rev:01, 3.11.2016
[2] Commission Implementing Regulation (EU) 2016/1185 of 20 July 2016
[3] Doc 9432, Manual of Radiotelephony, ICAO, 2006
[4] ICAO Annex 10 Aeronautical Telecommunications Volume II, Chapter 5, ICAO, 2001
[5] AIC A 006/2017 Postupci za obavljanje govorne komunikacije, HKZP, listopad 2017
[6] RMIT English Worldwide: Aviation English Radiotelephony English for Air Traffic Controllers, RMIT Training Pty Ltd, Melbourne, 2007
[7] https://wiki.mediu.edu.my/en/q/_/c/Q_code.html
[8] CAA Manual of Radiotelephony CAP413
[9] Doc 4444, Procedures for Air Navigation Services - Air Traffic Management, Chapter 12, ICAO, 2016
[10] ICAO Annex 14 Aerodromes, Volume I, ICAO, 2007
[11] Robertson, F. A., Airspeak, Pearson Longman, 2008
[12] APSL-[4]ADI-030102016-REV03, 2016
[13]http://www.crocontrol.hr/UserDocsImages/AIS%20produkti/VFR%20karta/VFR_01MAR2018-FS-sektor5.pdf
[14] Zbornik zrakoplovnih informacija Republike Hrvatske, Hrvatska kontrola zračne plovidbe d.o.o., 2018.
[15] ICAO Doc 7910 Location Indicators, ICAO, 2009.
[16] ICAO Doc 8585 Designators for Aircraft Operating Agencies,. ICAO, 2010
[17] HUSK Obrazac za praćenje napretka kandidata na praktičnim vježbama na simulatoru

11 APPENDICES

APPENDIX 1: VFR Chart of Zagreb CTR (LDZA and LDZL) [13]



APPENDIX 2: List Of Location Indicators, Runway Designators And Aerodromes In Croatia

The following list is taken from the Croatian AIP [15]

ABBREVIATION	RUNWAY	LOCATION
LDDU	12/30	Dubrovnik/Čilipi
LDLO	02/20	Lošinj/Lošinj I.
LDOS	11/29	Osijek/Klisa
LDPL	09/27	Pula/Pula
LDRI	14/32	Rijeka/Krk I.
LDSB	04/22	Brač/Brač I.
LDSP	05/23	Split/Kaštela (only R-H circuit for 05 and L-H for 23 due to Kozjak)
LDZA	05/23	Zagreb/Pleso
LDZL	28L710R	Zagreb/Lučko
LDZD	04/22	Zadar/Zemunik
LDZD	14/32	Zadar/Zemunik

APPENDIX 3: List Of Call Sign And Aerodrome Destination Abbreviations [15]

ABBREVIATION	CALL SIGN
AAL	American
AFR	Airfrance
AUA	Austrian
AZA	Alitalia
BAW	Speedbird
BER	Air Berlin
CFG	Condor
CTN	Croatia
CYP	Cyprus
DLH	Lufthansa
ELY	Elal
EWG	Eurowings
EZY	Easy
GWI	German wings
HLF	Hapag Lloyd
JAT	Jat
LGL	Luxair
LTU	Ltu
MGX	Montenegro
MPH	Martinair
OAL	Olympic
PGT	Sunturk
SAS	Scandinavian
SVA	Saudia
SWR	Swiss
TAR	Tunair
TCX	Kestrel
THY	Turkish
UAE	Emirates
UAL	United
WZZ	Wizair

LOC. INDICATOR	AERODROME
DTTA	Tunis
EDDF	Frankfurt
EDDL	Dusseldorf
EDDN	Nurnberg
EDDS	Stuttgart
EDNY	Friedrichshafen
EGCC	Manchester
EGLL	London
EGNT	Newcastle
EHAM	Amsterdam
HECA	Cairo
HEGN	Hurghada
LBSF	Sofia
LCLK	Larnaca
LFPG	Paris
LGAT	Athena
LGIR	Hraklion
LGKO	Kos
LGRP	Rodos
LGTS	Thessaloniki
LHBP	Budapest
LIRF	Rome
LLBG	Tel Aviv
LOWW	Vienna
LSZH	Zurich
LTBA	Istanbul
LWSK	Skopje
LYBG	Belgrade
LYPG	Podgorica
OEKK	Saudi Arabia

APPENDIX 4: List of Tables

APPENDIX 5: List of Abbreviations

ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATS	Air Traffic Services
CPDLC	Controller–pilot data link communications
CTR	Control Zone
EASA	European Aviation Safety Agency
EAT	Expected Approach Time
ETA	Estimated Time of Arrival
FIS	Flight Information Service
GMT	Greenwich Meridian Time
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
RVR	Runway Visual Range
UTC	Universal Time Coordinated
VFR	Visual Flight Rules
VHF	Very High Frequency

APPENDIX 6: Exercise for RTK I mid-term exam

I WHAT MUST ALWAYS BE READ BACK?

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14 _____
a) _____
b) _____
c) _____
d) _____
e) _____
f) _____
g) _____
h) _____

II WRITE DOWN THE PROCEDURE WORDS WITH THE FOLLOWING MEANING:

1. Beware of the following condition or situation _____.
2. A change has been made to your last clearance and this new clearance supersedes your previous clearance or part thereof _____.
3. An error has been made in this transmission. The correct version is... _____
4. Annul the previously transmitted clearance _____.
5. Authorized to proceed under the conditions specified _____.

III PROVIDE DEFINITIONS FOR THE FOLLOWING PROCEDURE WORDS:

1. contact _____
2. affirm _____
3. climb _____
4. wilco _____
5. monitor _____

IV WRITE DOWN HOW TO PRONOUNCE THE FOLLOWING NUMBERS IN RTF COM:

1. Mach number 0.74 _____
2. make one 180 _____
3. wind 200º 15kn _____
4. squawk 7500 _____
5. distance 15.5 km _____
6. altitude 3 500 _____
7. heading 250 _____
8. FL 300 _____
9. time 1000 _____
10. frequency 118,275_____

V ANSWER THE QUESTIONS:

1. What is QNH? _____
2. A condition concerning the safety of an aircraft which requires immediate assistance is _____
3. A message concerning the safety of an aircraft but does not require immediate assistance is called _____
4. Aircraft in the heavy wake turbulence category shall include the word "HEAVY" immediately after the aircraft call sign in the initial call between such aircraft and _____ _____ units.
5. How can the call sign Cessna ABCD be abbreviated? _____
6. How can the call sign CTN123 be abbreviated? _____
7. Must a "general call" be acknowledged and how? _____
8. Must a "multiple call" be acknowledged and how? _____
9. What does the term WET (amount of water on the runway) mean?_____
10. What is QDR? _____
11. What is the radiotelephony call sign for the aeronautical station providing surface movement control? _____
12. When transmitting time, which time system shall be used?_____

VI PROVIDE AN EXAMPLE OF THE INITIAL CALL BETWEEN AN AIRCRAFT AND THE ATSU PROVIDING AERODROME CONTROL SERVICE.

P: _____

C:_____

VII HOW IS CLOUD COVER REPORTED IN OCTAS:

1. _____ 3. _____
2. _____ 4. _____

VIII PROVIDE TERMS FOR THE FOLLOWING DEFINITIONS:

1. _____ A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.
2. _____ The vertical distance of a level, a point or an object considered as a point, measured from mean sea level.
3. _____ A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.
4. _____ A specified route designated for channelling the flow of traffic as necessary for the provision of air traffic services.

5. _____ An airspace of detailed dimensions established around an aerodrome for the protection of aerodrome traffic.
6. _____ One-way communication from aircraft to stations or locations on the surface of the earth.
7. _____ A controlled airspace extending upwards from a specified limit above the earth.
8. _____ A transmission from one station to another station in circumstances where two-way communication cannot be established but where it is believed that the called station is able to receive the transmission.
9. _____ Directives issued by air traffic control for the purpose of requiring a pilot to take a specific action.
10. _____ The elevation of the highest point of the landing area.

IX PROVIDE AN INITIAL CALL AND DEPARTURE INFORMATION TO AN IFR FLIGHT (14 POINTS):

P: _____

C: _____

_____

P: _____

C: _____

X NAME WAKE TURBULENCE CATEGORIES AND ITS MTOM (9 points):

1. _____ 3. _____

2. _____ 4. _____

XI NAME CATEGORIES OF MESSAGES IN THE CORRECT ORDER (7 points):

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

XII GIVE EXAMPLES OF THE FOLLOWING INSTRUCTIONS AND CLEARANCES:

1. INITIAL CALL AND DEPARTURE INFORMATION TO AN IFR FLIGHT (14 POINTS):

   P: _____

   C: _____

   _____

   P: _____

   C: _____

2. ASK THE PILOT IF S/HE WANTS TO RECEIVE ATS ROUTE CLEARANCE (4 POINTS)

   C: _____

   P: _____

3. ATS ROUTE CLEARANCE TO A VFR FLIGHT FROM ZAGREB TO OSIJEK (13 POINTS):

VFR	C172/L	0017		3000'	
		9ADEG		E	
	100		LDOS		

   C: _____

   _____

   P: _____

   _____

   C: _____

4. ATS ROUTE CLEARANCE TO A VFR TRAINING FLIGHT AT ZAGREB FOR RUNWAY 05 (15 POINTS):

VFR	PA18/L	0005		1500'	
		9ADPA		TGL	
	110	LDZA	LDZA		

   C: _____

   _____

   P: _____

   _____

   C: _____

5. INSTRUCTION THAT THE A/C IS TO BE STARTED WHEN THE PILOT WANTS, DEP. SLOT 1035 (11 POINTS):

   P: _____

C:_____

P:_____

C:_____

6. REQUEST TO THE AIRCRAFT CALLING TO REPEAT ITS TRANSMISSION BECAUSE YOU ARE NOT CERTAIN OF ITS CALLSIGN (3 POINTS):

   C:_____

7. ATS ROUTE CLEARANCE TO AN IFR FLIGHT FROM ZAGREB TO DUBROVNIK (13 POINTS):

IFR	A320/M	7073		FL130	
		CTN646		TEBLI2C	
	460	1125	LDDU		

   C:_____

   _____

   P:_____

   _____

   C:_____

8. INSTRUCTION THAT THE AIRCRAFT IS PROBABLY TO START UP AT A CERTAIN TIME (6 POINTS):

   P:_____

   C:_____

   P:_____

9. INSTRUCTION TO THE PILOT NOT TO ENTER THE RUNWAY (5 POINTS):

   C:_____

   P:_____

   C:_____

10. GENERAL CALL TO INFORM THE PILOTS THAT THE RUNWAY CENTERLINE LIGHTS ARE NOT WORKING (3 POINTS):

    C:_____

APPENDIX 7: Exercise for RTK I end-of-the-term exam

I GIVE EXAMPLES OF THE FOLLOWING INSTRUCTIONS AND CLEARANCES:

1. INITIAL CALL AND DEPARTURE INFORMATION TO AN IFR FLIGHT (14 POINTS):

   P: _____

   C: _____

   _____

   P: _____

   C: _____

2. ASK THE PILOT IF S/HE WANTS TO RECEIVE ATS ROUTE CLEARANCE (4 POINTS)

   C: _____

   P: _____

3. ATS ROUTE CLEARANCE TO A VFR FLIGHT FROM ZAGREB TO OSIJEK (13 POINTS):

VFR	C172/L	0017		3000' E	
		9ADEG			
	100		LDOS		

   C: _____

   _____

   P: _____

   _____

   C: _____

4. ATS ROUTE CLEARANCE TO A VFR TRAINING FLIGHT AT ZAGREB FOR RUNWAY 05 (15 POINTS):

VFR	PA18/L	0005		1500' TGL	
		9ADPA			
	110	LDZA	LDZA		

   C: _____

   _____

   P: _____

   _____

   C: _____

5. INSTRUCTION THAT THE A/C IS TO BE STARTED WHEN THE PILOT WANTS, DEP. SLOT 1035 (11 POINTS):

   P: _____

   C: _____

   P: _____

   C: _____

6. REQUEST TO THE AIRCRAFT CALLING TO REPEAT ITS TRANSMISSION BECAUSE YOU ARE NOT CERTAIN OF ITS CALLSIGN (3 POINTS):

   C: _____

7. ATS ROUTE CLEARANCE TO AN IFR FLIGHT FROM ZAGREB TO DUBROVNIK (13 POINTS):

IFR	A320/M	7073		FL130	
		CTN646		TEBLI2C	
	460	1125	LDDU		

   C: _____

   _____

   P: _____

   _____

   C: _____

8. INSTRUCTION THAT THE AIRCRAFT IS PROBABLY TO START UP AT A CERTAIN TIME (6 POINTS):

   P: _____

   C: _____

   P: _____

9. INSTRUCTION TO THE PILOT NOT TO ENTER THE RUNWAY (5 POINTS):

   C: _____

   P: _____

   C: _____

10. UPON LANDING INSTRUCTION TO LEAVE THE RUNWAY 05 AND GO TO THE APRON (5 POINTS):

    C: _____

    P: _____

    C: _____

11. GENERAL CALL TO INFORM THE PILOTS THAT THE RUNWAY CENTERLINE LIGHTS ARE NOT WORKING (3 POINTS):

    C: _____

    _____

12. INSTRUCTION TO THE PILOT WHAT TO DO AFTER LAW APPROACH (LDZA RWY 05) (____/4):

C:_____

_____

13. CANCELLING TAKE-OFF CLEARANCE DURING THE TAKE-OFF RUN (4 POINTS):

C:_____

_____

P:_____

14. LANDING CLEARANCE (____/3 POINTS):

C:_____

15. ASK THE PILOT IF S/HE WANTS TO TAKE OFF (____/3 POINTS):

C:_____

APPENDIX 8: ICAO Doc 4444 Definitions [4]

Accepting unit/controller. Air traffic control unit/air traffic controller next to take control of an aircraft.

Note.— See definition of "transferring unit/controller".

Advisory airspace. An airspace of defined dimensions, or designated route, within which air traffic advisory service is available.

Advisory route. A designated route along which air traffic advisory service is available.

Note.— Air traffic control service provides a much more complete service than air traffic advisory service; advisory areas and routes are therefore not established within controlled airspace, but air traffic advisory service may be provided below and above control areas.

Aerodrome. A defined area on land or water (including any buildings, installations and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Note.— The term "aerodrome" where used in the provisions relating to flight plans and ATS messages is intended to cover also sites other than aerodromes which may be used by certain types of aircraft, e.g. helicopters or balloons.

Aerodrome control service. Air traffic control service for aerodrome traffic.

Aerodrome control tower. A unit established to provide air traffic control service to aerodrome traffic.

Aerodrome elevation. The elevation of the highest point of the landing area.

Aerodrome traffic. All traffic on the manoeuvring area of an aerodrome and all aircraft flying in the vicinity of an aerodrome.

Note.— An aircraft is in the vicinity of an aerodrome when it is in, entering or leaving an aerodrome traffic circuit.

Aerodrome traffic circuit. The specified path to be flown by aircraft operating in the vicinity of an aerodrome.

Aeronautical fixed service (AFS). A telecommunication service between specified fixed points provided primarily for the safety of air navigation and for the regular, efficient and economical operation of air services.

Aeronautical fixed station. A station in the aeronautical fixed service.

Aeronautical ground light. Any light specially provided as an aid to air navigation, other than a light displayed on an aircraft.

Aeronautical Information Publication (AIP). A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aeronautical mobile service. A mobile service between aeronautical stations and aircraft stations, or between aircraft stations, in which survival craft stations may participate;

emergency position-indicating radio beacon stations may also participate in this service on designated distress and emergency frequencies.

Aeronautical station. A land station in the aeronautical mobile service. In certain instances, an aeronautical station may be located, for example, on board ship or on a platform at sea.

Aeronautical telecommunication station. A station in the aeronautical telecommunication service.

Airborne collision avoidance system (ACAS). An aircraft system based on secondary surveillance radar (SSR) transponder signals which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders.

Aircraft. Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.

Aircraft address. A unique combination of 24 bits available for assignment to an aircraft for the purpose of air-ground communications, navigation and surveillance.

Aircraft identification. A group of letters, figures or a combination thereof which is either identical to, or the coded equivalent of, the aircraft call sign to be used in air-ground communications, and which is used to identify the aircraft in ground-ground air traffic services communications.

Aircraft observation. The evaluation of one or more meteorological elements made from an aircraft in flight.

Aircraft proximity. A situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved may have been compromised. An aircraft proximity is classified as follows:

Risk of collision. The risk classification of an aircraft proximity in which serious risk of collision has existed.

Safety not assured. The risk classification of an aircraft proximity in which the safety of the aircraft may have been compromised.

No risk of collision. The risk classification of an aircraft proximity in which no risk of collision has existed.

Risk not determined. The risk classification of an aircraft proximity in which insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination.

Air-ground communication. Two-way communication between aircraft and stations or locations on the surface of the earth.

AIRMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect

the safety of low-level aircraft operations and which was not already included in the forecast issued for low-level flights in the flight information region concerned or sub-area thereof.
AIRPROX. The code word used in an air traffic incident report to designate aircraft proximity.
Air-report. A report from an aircraft in flight prepared in conformity with requirements for position, and operational and/or meteorological reporting.
Air-taxiing. Movement of a helicopter/VTOL above the surface of an aerodrome, normally in ground effect and at a ground speed normally less than 37 km/h (20 kt).
Note.— The actual height may vary, and some helicopters may require air-taxiing above 8 m (25 ft) AGL to reduce ground effect turbulence or provide clearance for cargo slingloads.
Air-to-ground communication. One-way communication from aircraft to stations or locations on the surface of the earth.
Air traffic. All aircraft in flight or operating on the manoeuvring area of an aerodrome.
Air traffic advisory service. A service provided within advisory airspace to ensure separation, in so far as practical, between aircraft which are operating on IFR flight plans.
Air traffic control clearance. Authorization for an aircraft to proceed under conditions specified by an air traffic control unit.
Note 1.— For convenience, the term "air traffic control clearance" is frequently abbreviated to "clearance" when used in appropriate contexts.
Note 2.— The abbreviated term "clearance" may be prefixed by the words "taxi", "take-off", "departure", "en-route", "approach" or "landing" to indicate the particular portion of flight to which the air traffic control clearance relates.
Air traffic control instruction. Directives issued by air traffic control for the purpose of requiring a pilot to take a specific action.
Air traffic control service. A service provided for the purpose of:
a) preventing collisions: 1) between aircraft, and 2) on the manoeuvring area between aircraft and obstructions; and
b) expediting and maintaining an orderly flow of air traffic.
Air traffic control unit. A generic term meaning variously, area control centre, approach control unit or aerodrome control tower.
Air traffic flow management (ATFM). A service established with the objective of contributing to a safe, orderly and expeditious flow of air traffic by ensuring that ATC capacity is utilized to the maximum extent possible, and that the traffic volume is compatible with the capacities declared by the appropriate ATS authority.
Air traffic management (ATM). The dynamic, integrated management of air traffic and airspace including air traffic services, airspace management and air traffic flow management — safely, economically and efficiently — through the provision of facilities and seamless services in collaboration with all parties and involving airborne and ground-based functions.

Air traffic management system. A system that provides ATM through the collaborative integration of humans, information, technology, facilities and services, supported by air and ground- and/or space-based communications, navigation and surveillance.

Air traffic service (ATS). A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air traffic services airspaces. Airspaces of defined dimensions, alphabetically designated, within which specific types of flights may operate and for which air traffic services and rules of operation are specified.

Note.— ATS airspaces are classified as Class A to G as shown in Annex 11, Appendix 4.

Air traffic services reporting office. A unit established for the purpose of receiving reports concerning air traffic services and flight plans submitted before departure.

Note.— An air traffic services reporting office may be established as a separate unit or combined with an existing unit, such as another air traffic services unit, or a unit of the aeronautical information service.

Air traffic services unit. A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

Airway. A control area or portion thereof established in the form of a corridor.

ALERFA. The code word used to designate an alert phase.

Alerting service. A service provided to notify appropriate organizations regarding aircraft in need of search and rescue aid, and assist such organizations as required.

Alert phase. A situation wherein apprehension exists as to the safety of an aircraft and its occupants.

Allocation, allocate. Distribution of frequencies, SSR codes, etc. to a State, unit or service. Distribution of 24-bit aircraft addresses to a State or common mark registering authority.

Alphanumeric characters (alphanumerics). A collective term for letters and figures (digits).

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate. An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en route.

Destination alternate. An alternate aerodrome to which an aircraft may proceed should it become either impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Altitude. The vertical distance of a level, a point or an object considered as a point, measured from mean sea level (MSL).

Approach control service. Air traffic control service for arriving or departing controlled flights.

Approach control unit. A unit established to provide air traffic control service to controlled flights arriving at, or departing from, one or more aerodromes.

Approach sequence. The order in which two or more aircraft are cleared to approach to land at the aerodrome.

Appropriate ATS authority. The relevant authority designated by the State responsible for providing air traffic services in the airspace concerned.

Appropriate authority.

a) Regarding flight over the high seas: The relevant authority of the State of Registry.

b) Regarding flight other than over the high seas: The relevant authority of the State having sovereignty over the territory being overflown.

Apron. A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Area control centre (ACC). A unit established to provide air traffic control service to controlled flights in control areas under its jurisdiction.

Area control service. Air traffic control service for controlled flights in control areas.

Area navigation (RNAV). A method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these.

Area navigation route. An ATS route established for the use of aircraft capable of employing area navigation.

ATIS. The symbol used to designate automatic terminal information service.

ATS route. A specified route designed for channelling the flow of traffic as necessary for the provision of air traffic services.

Note 1.— The term "ATS route" is used to mean variously, airway, advisory route, controlled or uncontrolled route, arrival or departure route, etc.

Note 2.— An ATS route is defined by route specifications which include an ATS route designator, the track to or from significant points (waypoints), distance between significant points, reporting requirements and, as determined by the appropriate ATS authority, the lowest safe altitude.

ATS surveillance service. A term used to indicate a service provided directly by means of an ATS surveillance system.

ATS surveillance system. A generic term meaning variously, ADS-B, PSR, SSR or any comparable ground-based system that enables the identification of aircraft.

Note.— A comparable ground-based system is one that has been demonstrated, by comparative assessment or other methodology, to have a level of safety and performance equal to or better than monopulse SSR.

Automatic dependent surveillance — broadcast (ADS-B). A means by which aircraft, aerodrome vehicles and other objects can automatically transmit and/or receive data such as identification, position and additional data, as appropriate, in a broadcast mode via a data link.

Automatic dependent surveillance — contract (ADS-C). A means by which the terms of an ADS-C agreement will be exchanged between the ground system and the aircraft, via a data link, specifying under what conditions ADS-C reports would be initiated, and what data would be contained in the reports.

Note.— The abbreviated term "ADS contract" is commonly used to refer to ADS event contract, ADS demand contract, ADS periodic contract or an emergency mode.

Automatic terminal information service (ATIS). The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof:

Data link-automatic terminal information service (D-ATIS). The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS). The provision of ATIS by means of continuous and repetitive voice broadcasts.

Base turn. A turn executed by the aircraft during the initial approach between the end of the outbound track and the beginning of the intermediate or final approach track. The tracks are not reciprocal.

Note.— Base turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

Blind transmission. A transmission from one station to another station in circumstances where two-way communication cannot be established but where it is believed that the called station is able to receive the transmission.

Broadcast. A transmission of information relating to air navigation that is not addressed to a specific station or stations.

Ceiling. The height above the ground or water of the base of the lowest layer of cloud below 6 000 m (20 000 ft) covering more than half the sky.

Clearance limit. The point to which an aircraft is granted an air traffic control clearance.

Code (SSR). The number assigned to a particular multiple pulse reply signal transmitted by a transponder in Mode A or Mode C.

Common point. A point on the surface of the earth common to the paths of two aircraft, used as a basis for describing longitudinal separation minima (e.g. significant point, waypoint, navigation aid, fix).

Note.— Common point is not used for operational purposes or in pilot-controller communications.

Control area. A controlled airspace extending upwards from a specified limit above the earth.

Controlled aerodrome. An aerodrome at which air traffic control service is provided to aerodrome traffic.

Note.— The term "controlled aerodrome" indicates that air traffic control service is provided to aerodrome traffic but does not necessarily imply that a control zone exists.

Controlled airspace. An airspace of defined dimensions within which air traffic control service is provided in accordance with the airspace classification.

Note.— Controlled airspace is a generic term which covers ATS airspace Classes A, B, C, D and E as described in Annex 11, 2.6.

Controlled flight. Any flight which is subject to an air traffic control clearance.

Controller-pilot data link communications (CPDLC). A means of communication between controller and pilot, using data link for ATC communications.

Control zone. A controlled airspace extending upwards from the surface of the earth to a specified upper limit.

Cruise climb. An aeroplane cruising technique resulting in a net increase in altitude as the aeroplane mass decreases.

Cruising level. A level maintained during a significant portion of a flight.

Current data authority. The designated ground system through which a CPDLC dialogue between a pilot and a controller currently responsible for the flight is permitted to take place.

Current flight plan (CPL). The flight plan, including changes, if any, brought about by subsequent clearances.

Note.— When the word "message" is used as a suffix to this term, it denotes the content and format of the current flight plan data sent from one unit to another.

Data convention. An agreed set of rules governing the manner or sequence in which a set of data may be combined into a meaningful communication.

Data link initiation capability (DLIC). A data link application that provides the ability to exchange addresses, names and version numbers necessary to initiate data link applications.

Data link-automatic terminal information service (D-ATIS)*.* The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS)*.* The provision of ATIS by means of continuous and repetitive voice broadcasts.

Data processing. A systematic sequence of operations performed on data.

Note.— Examples of operations are the merging, sorting, computing or any other transformation or rearrangement with the object of extracting or revising information, or of altering the representation of information.

Decision altitude (DA) or decision height (DH). A specified altitude or height in the precision approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1.— Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment

of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3.— For convenience where both expressions are used they may be written in the form "decision altitude/ height" and abbreviated "DA/H".

Dependent parallel approaches. Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway centre lines are prescribed.

DETRESFA. The code word used to designate a distress phase.

Discrete code. A four-digit SSR code with the last two digits not being "00".

Distress phase. A situation wherein there is reasonable certainty that an aircraft and its occupants are threatened by grave and imminent danger or require immediate assistance.

***Downstream data authority*.** A designated ground system, different from the current data authority through which the pilot can contact an appropriate ATC unit for the purposes of receiving a downstream clearance.

Elevation. The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.

Emergency phase. A generic term meaning, as the case may be, uncertainty phase, alert phase or distress phase.

Estimated elapsed time. The estimated time required to proceed from one significant point to another.

Estimated off-block time. The estimated time at which the aircraft will commence movement associated with departure.

Estimated time of arrival. For IFR flights, the time at which it is estimated that the aircraft will arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with the aerodrome, the time at which the aircraft will arrive over the aerodrome. For VFR flights, the time at which it is estimated that the aircraft will arrive over the aerodrome.

Expected approach time. The time at which ATC expects that an arriving aircraft, following a delay, will leave the holding fix to complete its approach for a landing.

Note.— The actual time of leaving the holding fix will depend upon the approach clearance.

Filed flight plan (FPL). The flight plan as filed with an ATS unit by the pilot or a designated representative, without any subsequent changes.

Note.— When the word "message" is used as a suffix to this term, it denotes the content and format of the filed flight plan data as transmitted.

Final approach. That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified, a) at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or b) at

the point of interception of the last track specified in the approach procedure; and ends at a point in the vicinity of an aerodrome from which:

1) a landing can be made; or

2) a missed approach procedure is initiated.

***Flight crew member*.** A licensed crew member charged with duties essential to the operation of an aircraft during a flight duty period.

Flight information centre. A unit established to provide flight information service and alerting service.

Flight information region (FIR). An airspace of defined dimensions within which flight information service and alerting service are provided.

Flight information service. A service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights.

Flight level. A surface of constant atmospheric pressure which is related to a specific pressure datum, 1 013.2 hectopascals (hPa), and is separated from other such surfaces by specific pressure intervals.

Note 1.— A pressure type altimeter calibrated in accordance with the Standard Atmosphere:

a) when set to a QNH altimeter setting, will indicate altitude;

b) when set to QFE altimeter setting, will indicate height above the QFE reference datum;

c) when set to a pressure of 1 013.2 hPa, may be used to indicate flight levels.

Note 2.— The terms "height" and "altitude", used in Note 1 above, indicate altimetric rather than geometric heights and altitudes.

Flight path monitoring. The use of ATS surveillance systems for the purpose of providing aircraft with information and advice relative to significant deviations from nominal flight path, including deviations from the terms of their air traffic control clearances.

Note.— Some applications may require a specific technology, e.g. radar, to support the function of flight path monitoring.

Flight plan. Specified information provided to air traffic services units, relative to an intended flight or portion of a flight of an aircraft.

Note.— Specifications for flight plans are contained in Annex 2. A Model Flight Plan Form is contained in Appendix 2 to this document.

Flight visibility. The visibility forward from the cockpit of an aircraft in flight.

Forecast. A statement of expected meteorological conditions for a specified time or period, and for a specified area or portion of airspace.

Glide path. A descent profile determined for vertical guidance during a final approach.

Ground effect. A condition of improved performance (lift) due to the interference of the surface with the airflow pattern of the rotor system when a helicopter or other VTOL aircraft is operating near the ground.

Note.— Rotor efficiency is increased by ground effect to a height of about one rotor diameter for most helicopters.

Ground visibility. The visibility at an aerodrome, as reported by an accredited observer or by automatic systems.

Heading. The direction in which the longitudinal axis of an aircraft is pointed, usually expressed in degrees from North (true, magnetic, compass or grid).

Height. The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

Holding fix. A geographical location that serves as a reference for a holding procedure.

Holding procedure. A predetermined manoeuvre which keeps an aircraft within a specified airspace while awaiting further clearance.

Hot spot. A location on an aerodrome movement area with a history or potential risk of collision or runway incursion, and where heightened attention by pilots/drivers is necessary.

***Human performance*.** Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

Identification. The situation which exists when the position indication of a particular aircraft is seen on a situation display and positively identified.

IFR. The symbol used to designate the instrument flight rules.

IFR flight. A flight conducted in accordance with the instrument flight rules.

IMC. The symbol used to designate instrument meteorological conditions.

INCERFA. The code word used to designate an uncertainty phase.

***Incident*.** An occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation.

Note.— The type of incidents which are of main interest to the International Civil Aviation Organization for accident prevention studies can be found at http://www.icao.int/anb/aig.

Independent parallel approaches. Simultaneous approaches to parallel or near-parallel instrument runways where radar separation minima between aircraft on adjacent extended runway centre lines are not prescribed.

Independent parallel departures. Simultaneous departures from parallel or near-parallel instrument runways.

Initial approach segment. That segment of an instrument approach procedure between the initial approach fix and the intermediate approach fix or, where applicable, the final approach fix or point.

Instrument approach procedure (IAP). A series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply. Instrument approach procedures are classified as

follows:

Non-precision approach (NPA) procedure*.* An instrument approach procedure which utilizes lateral guidance but does not utilize vertical guidance.

Approach procedure with vertical guidance (APV)*.* An instrument procedure which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach (PA) procedure*.* An instrument approach procedure using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:
a) a ground-based navigation aid; or b) computer-generated navigation data.

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, less than the minima specified for visual meteorological conditions.

Note 1.— The specified minima for visual meteorological conditions are contained in Chapter 3 of Annex 2.

Note 2.— In a control zone, a VFR flight may proceed under instrument meteorological conditions if and as authorized by air traffic control.

Landing area. That part of a movement area intended for the landing or take-off of aircraft.

Level. A generic term relating to the vertical position of an aircraft in flight and meaning variously, height, altitude or flight level.

Location indicator. A four-letter code group formulated in accordance with rules prescribed by ICAO and assigned to the location of an aeronautical fixed station.

Manoeuvring area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

Meteorological information. Meteorological report, analysis, forecast, and any other statement relating to existing or expected meteorological conditions.

Meteorological office. An office designated to provide meteorological service for international air navigation.

Meteorological report. A statement of observed meteorological conditions related to a specified time and location.

Minimum fuel. The term used to describe a situation in which an aircraft's fuel supply has reached a state where little or no delay can be accepted.

Note.— This is not an emergency situation but merely indicates that an emergency situation is possible, should any undue delay occur.

Missed approach procedure. The procedure to be followed if the approach cannot be continued.

Mode (SSR). The conventional identifier related to specific functions of the interrogation signals transmitted by an SSR interrogator. There are four modes specified in Annex 10: A, C, S and intermode.

Movement area. That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

Near-parallel runways. Non-intersecting runways whose extended centre lines have an angle of convergence/divergence of 15 degrees or less.

Normal operating zone (NOZ). Airspace of defined dimensions extending to either side of an ILS localizer course and/or MLS final approach track. Only the inner half of the normal operating zone is taken into account in independent parallel approaches.

NOTAM. A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

No transgression zone (NTZ). In the context of independent parallel approaches, a corridor of airspace of defined dimensions located centrally between the two extended runway centre lines, where a penetration by an aircraft requires a controller intervention to manoeuvre any threatened aircraft on the adjacent approach.

Obstacle clearance altitude (OCA) or obstacle clearance height (OCH). The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form "obstacle clearance altitude/height" and abbreviated "OCA/H".

Operational control. The exercise of authority over the initiation, continuation, diversion or termination of a flight in the interest of the safety of the aircraft and the regularity and efficiency of the flight.

Operator. A person, organization or enterprise engaged in or offering to engage in an aircraft operation.

Pilot-in-command. The pilot designated by the operator, or in the case of general aviation, the owner, as being in command and charged with the safe conduct of a flight.

Precision approach radar (PAR). Primary radar equipment used to determine the position of an aircraft during final approach, in terms of lateral and vertical deviations relative to a nominal

approach path, and in range relative to touchdown.

Note.— Precision approach radars are designated to enable pilots of aircraft to be given guidance by radiocommunication during the final stages of the approach to land.

Pressure-altitude. An atmospheric pressure expressed in terms of altitude which corresponds to that pressure in the Standard Atmosphere.* * As defined in Annex 8.

Primary radar. A radar system which uses reflected radio signals.

Primary surveillance radar (PSR). A surveillance radar system which uses reflected radio signals.

Procedural control. Term used to indicate that information derived from an ATS surveillance system is not required for the provision of air traffic control service.

Procedural separation. The separation used when providing procedural control.

Procedure turn. A manoeuvre in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

Note 1.— Procedure turns are designated "left" or "right" according to the direction of the initial turn.

Note 2.— Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual procedure.

Profile. The orthogonal projection of a flight path or portion thereof on the vertical surface containing the nominal track.

PSR blip. The visual indication, in non-symbolic form, on a situation display of the position of an aircraft obtained by primary radar.

Radar. A radio detection device which provides information on range, azimuth and/or elevation of objects.

Radar approach. An approach in which the final approach phase is executed under the direction of a controller using radar.

Radar clutter. The visual indication on a situation display of unwanted signals.

Radar contact. The situation which exists when the radar position of a particular aircraft is seen and identified on a situation display.

Radar identification*.* The situation which exists when the radar position of a particular aircraft is seen on a radar display and positively identified by the air traffic controller.

Note.— The specified minima are contained in Annex 2.

Radar separation. The separation used when aircraft position information is derived from radar sources.

Receiving unit/controller. Air traffic services unit/air traffic controller to which a message is sent.

Repetitive flight plan (RPL). A flight plan related to a series of frequently recurring, regularly operated individual flights with identical basic features, submitted by an operator for retention and repetitive use by ATS units.

Reporting point. A specified geographical location in relation to which the position of an aircraft can be reported.

Required communication performance (RCP). A statement of the performance requirements for operational communication in support of specific ATM functions.

Required navigation performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace.

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Rescue coordination centre. A unit responsible for promoting efficient organization of search and rescue services and for coordinating the conduct of search and rescue operations within a search and rescue region.

Rescue unit. A unit composed of trained personnel and provided with equipment suitable for the expeditious conduct of search and rescue.

Runway**.** A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

Runway-holding position. A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Note.— In radiotelephony phraseologies, the expression "holding point" is used to designate the runway-holding position.

Runway incursion. Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle or person on the protected area of a surface designated for the landing and take-off of aircraft.

Runway visual range (RVR)**.** The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

Safety management system (SMS). A systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures.

Secondary radar. A radar system wherein a radio signal transmitted from the radar station initiates the transmission of a radio signal from another station.

Secondary surveillance radar (SSR). A surveillance radar system which uses transmitters/receivers (interrogators) and transponders.

Segregated parallel operations. Simultaneous operations on parallel or near-parallel instrument runways in which one runway is used exclusively for approaches and the other runway is used exclusively for departures.

Sending unit/controller. Air traffic services unit/air traffic controller transmitting a message.

Note.— See definition of "receiving unit/controller".

Shoreline. A line following the general contour of the shore, except that in cases of inlets or bays less than 30 nautical miles in width, the line shall pass directly across the inlet or bay to intersect the general contour on the opposite side.

SIGMET information. Information issued by a meteorological watch office concerning the occurrence or expected occurrence of specified en-route weather phenomena which may affect the safety of aircraft operations.

Significant point. A specified geographical location used in defining an ATS route or the flight path of an aircraft and for other navigation and ATS purposes.

Situation display. An electronic display depicting the position and movement of aircraft and other information as required.

Slush. Water-saturated snow which with a heel-and-toe slap-down motion against the ground will be displaced with a splatter; specific gravity: 0.5 up to 0.8.

Note.— Combinations of ice, snow and/or standing water may, especially when rain, rain and snow, or snow is falling, produce substances with specific gravities in excess of 0.8. These substances, due to their high water/ice content, will have a transparent rather than a cloudy appearance and, at the higher specific gravities, will be readily distinguishable from slush.

Snow (on the ground).

a) *Dry snow.* Snow which can be blown if loose or, if compacted by hand, will fall apart upon release; specific gravity: up to but not including 0.35.

b) *Wet snow.* Snow which, if compacted by hand, will stick together and tend to or form a snowball; specific gravity: 0.35 up to but not including 0.5.

c) *Compacted snow.* Snow which has been compressed into a solid mass that resists further compression and will hold together or break up into lumps if picked up; specific gravity: 0.5 and over.

Special VFR flight. A VFR flight cleared by air traffic control to operate within a control zone in meteorological conditions below VMC.

SSR response. The visual indication, in non-symbolic form, on a situation display, of a response from an SSR transponder in reply to an interrogation.

Standard instrument arrival (STAR). A designated instrument flight rule (IFR) arrival route linking a significant point, normally on an ATS route, with a point from which a published instrument approach procedure can be commenced.

Standard instrument departure (SID). A designated instrument flight rule (IFR) departure route linking the aerodrome or a specified runway of the aerodrome with a specified significant point, normally on a designated ATS route, at which the en-route phase of a flight commences.

Stopway. A defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of an abandoned take-off.

Surveillance radar. Radar equipment used to determine the position of an aircraft in range and azimuth.

Taxiing. Movement of an aircraft on the surface of an aerodrome under its own power, excluding take-off and landing.

Taxiway. A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including:

a) *Aircraft stand taxilane.* A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.

b) *Apron taxiway.* A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.

c) *Rapid exit taxiway.* A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimizing runway occupancy times.

Terminal control area (TMA). A control area normally established at the confluence of ATS routes in the vicinity of one or more major aerodromes.

Threshold. The beginning of that portion of the runway usable for landing.

Total estimated elapsed time. For IFR flights, the estimated time required from take-off to arrive over that designated point, defined by reference to navigation aids, from which it is intended that an instrument approach procedure will be commenced, or, if no navigation aid is associated with the destination aerodrome, to arrive over the destination aerodrome. For VFR flights, the estimated time required from take-off to arrive over the destination aerodrome.

Touchdown. The point where the nominal glide path intercepts the runway.

Note.— "Touchdown" as defined above is only a datum and is not necessarily the actual point at which the aircraft will touch the runway.

Track. The projection on the earth's surface of the path of an aircraft, the direction of which path at any point is usually expressed in degrees from North (true, magnetic or grid).

Traffic avoidance advice. Advice provided by an air traffic services unit specifying manoeuvres to assist a pilot to avoid a collision.

Traffic information. Information issued by an air traffic services unit to alert a pilot to other known or observed air traffic which may be in proximity to the position or intended route of flight and to help the pilot avoid a collision.

Transfer of control point. A defined point located along the flight path of an aircraft, at which the responsibility for providing air traffic control service to the aircraft is transferred from one control unit or control position to the next.

Transferring unit/controller. Air traffic control unit/air traffic controller in the process of transferring the responsibility for providing air traffic control service to an aircraft to the next air traffic control unit/air traffic controller along the route of flight.

Transition altitude. The altitude at or below which the vertical position of an aircraft is controlled by reference to altitudes.

Transition layer. The airspace between the transition altitude and the transition level.

Transition level. The lowest flight level available for use above the transition altitude.

Uncertainty phase. A situation wherein uncertainty exists as to the safety of an aircraft and its occupants.

Unmanned free balloon. A non-power-driven, unmanned, lighter-than-air aircraft in free flight.

Note.— Unmanned free balloons are classified as heavy, medium or light in accordance with specifications contained in Annex 2, Appendix 4.

Vectoring. Provision of navigational guidance to aircraft in the form of specific headings, based on the use of an ATS surveillance system.

VFR. The symbol used to designate the visual flight rules.

VFR flight. A flight conducted in accordance with the visual flight rules.

Visibility. Visibility for aeronautical purposes is the greater of:

a) the greatest distance at which a black object of suitable dimensions, situated near the ground, can be seen and recognized when observed against a bright background;

b) the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

Note 1.— The two distances have different values in air of a given extinction coefficient, and the latter b) varies with the background illumination. The former a) is represented by the meteorological optical range (MOR).

Note 2.— The definition applies to the observations of visibility in local routine and special reports, to the observations of prevailing and minimum visibility reported in METAR and SPECI and to the observations of ground visibility.

Visual approach. An approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed in visual reference to terrain.

Visual meteorological conditions. Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.

Note.— The specified minima are contained in Annex 2, Chapter 4.

VMC. The symbol used to designate visual meteorological conditions.

Waypoint. A specified geographical location used to define an area navigation route or the flight path of an aircraft employing area navigation. Waypoints are identified as either:

Fly-by waypoint. A waypoint which requires turn anticipation to allow tangential interception of the next segment of a route or procedure, or

Flyover waypoint. A waypoint at which a turn is initiated in order to join the next segment of a route or procedure.