IVAO INDONESIA DIVISION

Advance ATC TRAINING HANDBOOK 2012

Advance Controller Training.

Approach Controller

The Approach Training (APC/ACC) contains a series of tasks to verify good ATC theoretical knowledge and controlling skills.
4.1 IVAO software and communication modes
You can use any IVAO approved client for the exam. Visit the IVAO virtual ATC client page (IvAc) for a complete list (the page also includes a link to the IvAc manuals).
The examiner will check your ability to correctly use the main functions of the software, mainly:

- establish a text and/or voice communication with pilots,
- fill out a correct ATIS,
- be able to transmit by text on the your ATC frequency and privately,
- retrieve a distant station METAR and TAF.

Theoretical knowledge for the Advance Training

- Decode METAR / TAF
- Ability to explain the charts for APP operation
- Good knowledge of VFR rules, SVFR, Night VFR and controlled VFR. (as applicable in the division)
- Explain Y and Z flight plans including procedures for giving the appropriate Clearances
- Knowledge of airspace set up in the TMA and FIR around the airport including classifications, also related from the point of view of separation, information, responsibilities pilot / controller
- Knowledge TRL/TA, QNH, QFE, QDM, QDR, wake turbulence separations according a/c mass, important aerodrome MET- phenomena (wind shear) and how to inform the pilot about it
- Procedural control
- Knowledge of the approach procedures (ILS, published VOR and NDB approach, holdings, performance at low speeds)
- Knowledge of MCA, MRVA and SRA (surveillance radar approach) and relevance between different ILS categories, missed approach

Practical performance Advance Training

- Fill out ATIS correctly
- Suitable and sufficient coordination with adjacent ATC units in all necessary situations
- Suitable and sufficient traffic information and traffic management
- Handle miscellaneous emergency situations
- Good SSR identification procedures
- Observance of MRVA, MSA, MEA during radar vectoring and direct routes
- Ability to provide radar vectors
- Ability to monitor and assist pilots, if they ask for information
- Use of holding stacks and passing of EATs
- Radar separation and expeditious traffic flow
- In some countries procedural control is used to ensure safe separation
- Have a good overview (also in stressful situations)
- Correct phraseology and English proficiency

How to decode METAR:

What is a METAR?

A METAR is a coded weather observation issued on a regular basis by meteorological offices.
The acronym **METAR** stands for **MET**eorological **A**erodrome **R**eport and is thus related to the weather of a specific airport at the specified time of observation.
METAR (and SPECI, see further) shall contain the following elements in the order indicated:

- identification of the type of report;
- location indicator;
- time of the observation;
- identification of an automated or missing report, when applicable;
- surface wind direction and speed;
- visibility;
- runway visual range, when applicable;
- present weather;
- cloud amount, cloud type (only for cumulonimbus and towering cumulus clouds) and height of cloud base (AGL) or, where measured, vertical visibility;

- air temperature and dew-point temperature; and
- QNH and, when applicable, QFE (QFE included only in local routine and special reports),
- followed eventually by specific remarks.

What is a SPECI?

A **SPECI**al report is basically an abbreviated METAR which is issued whenever weather conditions fluctuate about or are about below specified minima. They are recognisable by the time of issue which is out of sequence compared with the regular METAR report.

What does AUTO mean?

An **AUTO**matic report is distinguished by the word AUTO inserted behind the date/time group. Automatic reports are generally regarded as less accurate.

What does TAF mean?

A **TAF** is a **T**erminal **A**rea **F**orecast. As it's name implies, it is a weather prediction rather than an observation. Aerodrome forecasts and amendments thereto shall be issued as TAF and include the following information in the order indicated:

- identification of the type of forecast;
- location indicator;
- time of issue of forecast;
- identification of a missing forecast, when applicable;
- date and period of validity of forecast;
- identification of a cancelled forecast, when applicable;
- surface wind;
- visibility;
- weather;
- cloud; and
- expected significant changes to one or more of these elements during the period of validity.

In the further explanation and examples the most common specifications and weather phenomena are used. For the full details one could look up the relevant documentation as available in the professional circuits:)
A SPECI message is identical to a METAR but is established punctually instead of regularly. It is a special observation message highlighting any significant change since the last METAR or SPECI was issued.
A TAF is a terminal forcast. It is issued every few hours, and is updated if necessary sooner.

METAR explained

Example:

METAR	KRNO	210056Z	05012KT	10SM	-SN	BKN050
1	2	3	4	5	6	7

1. Message Type:

- METAR: routine weather report
- SPECI: special weather report, triggered by a weather change
- AUTO will be first item for ASOS/AWOS generated reports

2. ICAO Identifier (4-letter)
3. Issuance Time DDHHMMz (UTC)
4. Wind

- First 3 digits: True Wind direction or average if variable (VRB).

Note: If the wind direction varies 60° or more, the direction will be indicated with a V (e.g. 180V250)

- Next 2 digits: Mean speed and units

- Next 2 digits: Mean speed and units

KT=knots, KMH=kilometers/hour, MPS=meters/second

- G (gust) as needed – 2 or 3 digit maximum speed
- Calm will be indicated by 00000KT
- *Example: 18012G22KT 150V240*

5. Horizontal Visibility

Prevailing Visibility (PV)

- Statue miles (SM) and fractions (US & Canada only) or,
- 4 digit minimum visibility in meters, and,
- Lowest value and direction, as required (shown as a remark)

Runway Visual Range (RVR)

- R: Runway Designator, L/R/C as needed, "/" (L=left; R=right; C=center)
- P/M: Plus/Minus (+/- US only)
- 4 digit value (feet/meters)
- V (variability) with tendency U/D/N (up/down/no change)
- *Example: R18R/1200FTV/U*

6. Present Weather (Constructed sequentially)

- Intensity
- Descriptor
- Precipitation (Dominant type is listed first if more than one type reported)
- Obscuration
- Other

Qualifier				Weather Phenomena				
Intensity or Proximity		Descriptor		Precipitation		Obscuration		
-	Light	BC	Patches	DZ	Drizzle	BR	Mist (1)	DS
		BL	Blowing (2)	GR	Hail (3)	DU	Widespread Dust	
No qualifier	Moderate	DR	Low Drifting (4)	GS	Small Hail and/or snow pellets (5)	FG	Fog (6)	FC
		FZ	Freezing	IC	Ice Crystals	FU	Smoke	PO
+	Heavy	MI	Shallow	PL	Ice Pellets	HZ	Haze	SQ
		PR	Partial	RA	Rain	SA	Sand	
VC	Vicinity (7)	SH	Shower(s)	SG	Snow Grains	VA	Volcanic Ash	SS
		TS	Thunderstorm	SN	Snow			
				UP	Unknown Precipitation			

(1) Visibility at least 1000m (5/8SM) but not more than 9600m (6SM)
(2) 6 feet or more above the ground
(3) Hailstone diameter 5mm or greater
(4) Less than 6 feet above the ground
(5) Hailstone diameter less than 5mm
(6) Visibility less than 1000m (5/8SM)
(7) Within 8KM (5SM) of the aerodrome but not at the aerodrome

7. Sky Cover ABOVE GROUND LEVEL (AGL)

Cloud Description:

- Amount in eights (octas)
- SKC=Sky Clear (clear below 12,000 for ASOS/AWOS)
- NSC=No significant clouds
- FEW=Few (1/8 to 2/8 sky cover)
- SCT=Scattered (3/8 to 4/8 sky cover)
- BKN=Broken (5/8 to 7/8 sky cover)
- OVC=Overcast (8/8 sky cover)

Example: BKN050 means cloud condition is broken at 5000 feet above ground level (agl)

8. Temperature/Dewpoint (whole °C) (preceded by M=minus)

- First 2 digits = temperature
- Second 2 digits = dewpoint

9. Altimeter setting (QNH) and indicator (A=InHg, Q=hPa)

10. Supplementary Information

- RE = Recent weather followed by weather codes
- WS = Windshear, followed by:
  - *TKOF/LDG (takeoff/landing)*
  - *RWY (2 digits runway identifier and designator L/R/C)*
- RMK = Remark
- SLP = Sea Level Pressure
- T00221083 (Expanded temp/dewpoint)

1st, 5th digits: 0=plus, 1=minus
2nd-4th digits: temp (decimal missing) (02.2)
6th-8th digits: dewpoint (decimal missing) (-8.3)

11. Trend Forecast (2 hours from time of observation) (Not used in US)

- PROB and 2 digits (30 or 40) = probability 30% or 40%
- *Used to indicate the probability of occurance of alternate element(s) or temporary fluctuations*
- *Change Indicator*
- *BECMG = Becoming (used where changes are expected to reach or pass through specified values)*
- *TEMPO = Temporary (fluctuations of less than one hour duration)*
- *NOSIG = No significant change*

- Forecast Wind (same as item 4)
- Forecast Visibility (as item 5) (9999 indicates 10Kilometers vis or greater)
- Forecast Weather (as item 6)
- Forecast Cloud (as item 7)

Eight Figure Group

Eight Figure Group	
1st two digits	Runway designator
3rd digit	Runway deposits
4th digit	Extent of runway contamination
5th and 6th digits	Depth of deposit
7th and 8th digits	Friction coefficient or braking action

The first two digits correspond to the runway designator. For parallel runways LEFT is indicated by the designator only (18L would be displayed as 18) and RIGHT has 50 added (18R would be displayed as 68). When all runways are affected the figure group 88 will be used. If 99 appears as the first two digits the information is a repetition of the last message because no new message has been received in time for transmission.Runway Deposits

Runway Deposits		**Extent of Runway Contamination**		**Depth of Deposit**	
0	Clear & Dry	1	<10% contaminated (covered)	00	Less than 1mm
1	Damp	2	11% to 25% contaminated (covered)	01-90	Measurement in mm
2	Wet or water particles			92	10cm
3	Rime or frost covered (normally > 1mm)	5	26%-50% contaminated (covered)	93	15cm
4	Dry Snow	9	51%-100% contaminated (covered)	94	20cm
5	Wet Snow			95	25cm
6	Slush	/	Not reported (runway clearance in progress)	96	30cm
7	Ice			97	35cm
8	Compacted or rolled snow			98	40cm or more
9	Frozen ruts or ridges			99	Runway not operational due to snow, slush, ice, large drifts or runway clearance, depth not reported
/	Not reported (runway clearance in progress)			//	Not operationally significant or not measurable

Note: The quoted depth is the mean of a number of reading or if operationally significant the greatest depth measured.

Friction Coefficient or Braking Action (7th and 8th digits)	
28	Friction coefficient 0.28
35	Friction coefficient 0.35
91	Braking action poor
92	Braking action medium to poor
93	Braking action medium
94	Braking action medium to good
95	Braking action good
99	Figures unreliable
//	Braking action not reported or runway not operations or airport closed.

Note: Where braking action is assessed at a number of points along the runway the main value will be transmitted or if operationally significant the lowest value. If measuring equipment does not allow measurement of friction with satisfactory reliability (such as contaminated by wet snow, slush or loose snow) the figure 99 will be used.

Automated Surface/Weather Observation System (ASOS/AWOS)

Note: FAA only.
The Automated Surface Observation System (ASOS) and Automated Weather Observation System (AWOS) observe and report altimeter setting, wind direction and speed, temperature, dewpoint, visibility and ceiling/cloud height. Pilots may use automated weather observation from ASOS/AWOS, provided the observations from ASOS/AWOS, provided the observation includes all necessary weather parameters, and that the system is installed, operated and maintained according to applicable FAA standards.
Pilots may obtain the ASOS/AWOS reports through written, radio or telephone methods. Refer to METAR section for ASOS/AWOS report format.
ASOS/AWOS observations may not be used as an authorized weather observation if either the visibility or the wind is reported as missing.
ASOS/AWOS observation are unusable for the purpose of initiating or conducting an instrument approach if the altimeter setting is reported as missing unless an approved alternate source is noted on the applicable approach chart.

TAF explained

Example:

TAF	KRNO	202320Z	210024	04010G20KT	P6SM	-SN	SCT060
1	2	3	4	5	6	7	8

FM0300	05008KT	P6SM	SCT060
9			

1. Type of report (TAF)
2. ICAO Identifier (4 letter)
3. Issuance time (DDHHMMZ) UTC. May precede ICAO identifier at some airports.
4. Day (DD). Hour begins (1st two digits XX) Hour ends (2nd two digits).
5. Wind. First 3 digits true wind direction or average if variable. If the wind varies 60° or more, the direction will be indicated with a V (e.g. 120V190). Next two digits Mean speed and units (KT=knots, KMH=kilometers per hour, or MPS=meters per second). G=gust as needed (2 or 3 digits). Calm will be indicated by 00000XXX (XXX will be replaced by the appropriate units).
6. Horizontal visibility.
a. Prevailing visibility (PV)

- Statute Miles (SM) and fractions (US only), or
- 4 digit minimum visibility in meters, and
- Lowest value and direction, as required

b. Runway Visual Range (RVR)

- R=Runway Designator, L/R/C as needed, "/"
- P/M=Plus/Minus (US Only)
- 4 digit value (feet/meters)
- V(variability) with tendency U/D/N (up/down/no change)

7. Present Weather (constructed sequentially):

- Intensity
- Descriptor
- Precipitation (Dominant type is listed first if more than one type reported)
- Obscuration
- Other

<table>
<tr><td colspan="3">Qualifier</td><td colspan="5">Weather Phenomena</td></tr>
<tr><td colspan="2">Intensity or Proximity</td><td colspan="2">Descriptor</td><td colspan="2">Precipitation</td><td colspan="2">Obscuration</td><td></td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Light</td><td>BC</td><td>Patches</td><td>DZ</td><td>Drizzle</td><td>BR</td><td>Mist (1)</td><td rowspan="2">DS</td></tr>
<tr><td>BL</td><td>Blowing (2)</td><td>GR</td><td>Hail (3)</td><td>DU</td><td>Widespread Dust</td></tr>
<tr><td rowspan="2">No qualifier</td><td rowspan="2">Moderate</td><td>DR</td><td>Low Drifting (4)</td><td>GS</td><td>Small Hail and/or snow pellets (5)</td><td>FG</td><td>Fog (6)</td><td>FC</td></tr>
<tr><td>FZ</td><td>Freezing</td><td>IC</td><td>Ice Crystals</td><td>FU</td><td>Smoke</td><td>PO</td></tr>
<tr><td rowspan="2">+</td><td rowspan="2">Heavy</td><td>MI</td><td>Shallow</td><td>PL</td><td>Ice Pellets</td><td>HZ</td><td>Haze</td><td rowspan="2">SQ</td></tr>
<tr><td>PR</td><td>Partial</td><td>RA</td><td>Rain</td><td>SA</td><td>Sand</td></tr>
<tr><td rowspan="3">VC</td><td rowspan="3">Vicinity (7)</td><td>SH</td><td>Shower(s)</td><td>SG</td><td>Snow Grains</td><td rowspan="3">VA</td><td rowspan="3">Volcanic Ash</td><td rowspan="3">SS</td></tr>
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(12)Hailstone diameter less than 5mm
(13)Visibility less than 1000m (5/8SM)
(14)Within 8KM (5SM) of the aerodrome but not at the aerodrome</td></tr>
</table>

8. Sky Cover

- Cloud Description
- Amount in eights (octas)

SKC=Sky Clear (clear below 12,000 for ASOS/AWOS)
NSC=No significant clouds
FEW=Few (1/8 to 2/8 sky cover)
SCT=Scattered (3/8 to 4/8 sky cover)
BKN=Broken (5/8 to 7/8 sky cover)
OVC=Overcast (8/8 sky cover)

- Height: 100s of feet (30m)
- Type CB (Cumulonimbus) or TCU (Towering cumulus) only.

CAVOK – Ceiling and visibility OK (not used in US). Replaces visibility/RVR, present weather, and clouds if:

- Visibility is 10KM or greater
- No CB and no cloud below 1500M (5000ft) or below highest minimum sector altitude whichever is greater, and
- No precipitation, thunderstorm, sandstorm, duststorm, shallow fog, or low drifting dust/sand/snow.

Vertical visibility (when sky obscured) – VV100's of feet (30m) (VV /// means vertical visibility unavailable)

Optional groups (Forecast icing, Turbulence, & Temperature)
T= Temperature group indicator
Temperature: two digits (if below 0°, will be preceded by “M”),”/”
Expected time temperature will be reached: 2 digits, Z.
Icing Layer(s): 6 digits for each icing group (6WXXXY).
6: first digit of the icing group is always a 6.

Icing type: Second digit:

	Icing Intensity	Location
0	None	None
1	Light Icing	
2	Light Icing	In cloud
3	Light Icing	In precipitation
4	Moderate	
5	Moderate	In cloud
6	Moderate	In precipitation
7	Severe	
8	Severe	In cloud
9	Severe	In precipitation

Icing layer’s base: next 3 digits. (direct reading in 100s of ft/30s meters)

Thickness of icing layer: last digit:

	Thickness of Layer
0	Up to top of cloud
1	300m/1000’
2	600m/2000’
3	900m/2000’
4	1200m/4000’
5	1500m/5000’
6	1800m/6000’
7	2100m/7000’
8	2400m/8000’
9	2700m/9000’

Turbulence Layer(s): 6 Digits (5WXXXY)

5: first digit of the turbulence group is always a 6.

Turbulence type: Second digit:

	Intensity	Weather Condition	Freq
0	None		
1	Light		
2	Moderate	Clear	Occa

3	Moderate	Clear	Frec
4	Moderate	Cloud	Occa
5	Moderate	Cloud	Frec
6	Severe	Clear	Occa
7	Severe	Clear	Frec
8	Severe	Cloud	Occa
9	Severe	Cloud	Frec

Turbulence layer's base: next 3 digits. (direct reading in 100s of ft/30s meters)

Thickness of turbulence layer: last digit:

	Thickness of Layer
0	Up to top of cloud
1	300m/1000′
2	600m/2000′
3	900m/2000′
4	1200m/4000′
5	1500m/5000′
6	1800m/6000′
7	2100m/7000′
8	2400m/8000′
9	2700m/9000′

Significant Changes In Forecast

1. Probability groups(s)

- PROB and 2 digits (30 or 40).
- Probability 30% or 40% used to indicate the probability of occurrence of alternate element(s) or temporary fluctuations. (US will only use 40%). May also be listed as TEMPO by some non US weather services.
- TIME (beginning 2 digits, ending 2 digits)
- Forecast weather phenomena.

2. Forecast Change

Indicators

- BCMG=Becoming (used when changes are expected to reach or pass through specified values)
- FM = From and 2 digit time
- TO = To and 2 digit time
- TEMPO = Temporary fluctuation
- Forecast weather phenomena.

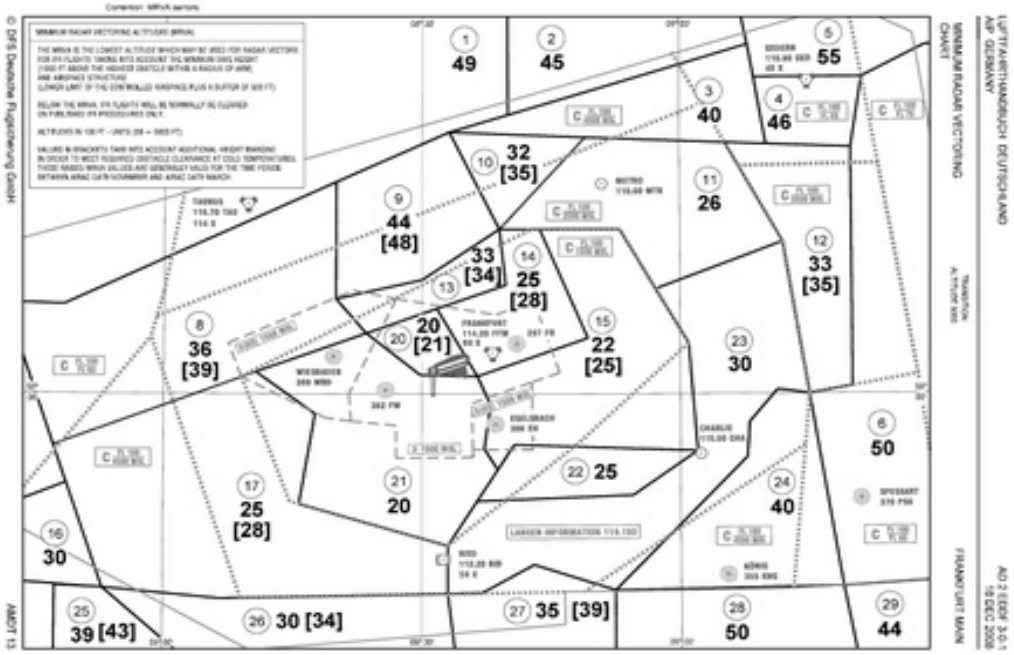
Minimum Radar Vectoring Altitude (MRVA)

Minimum Radar Vectoring Altitude (MRVA)

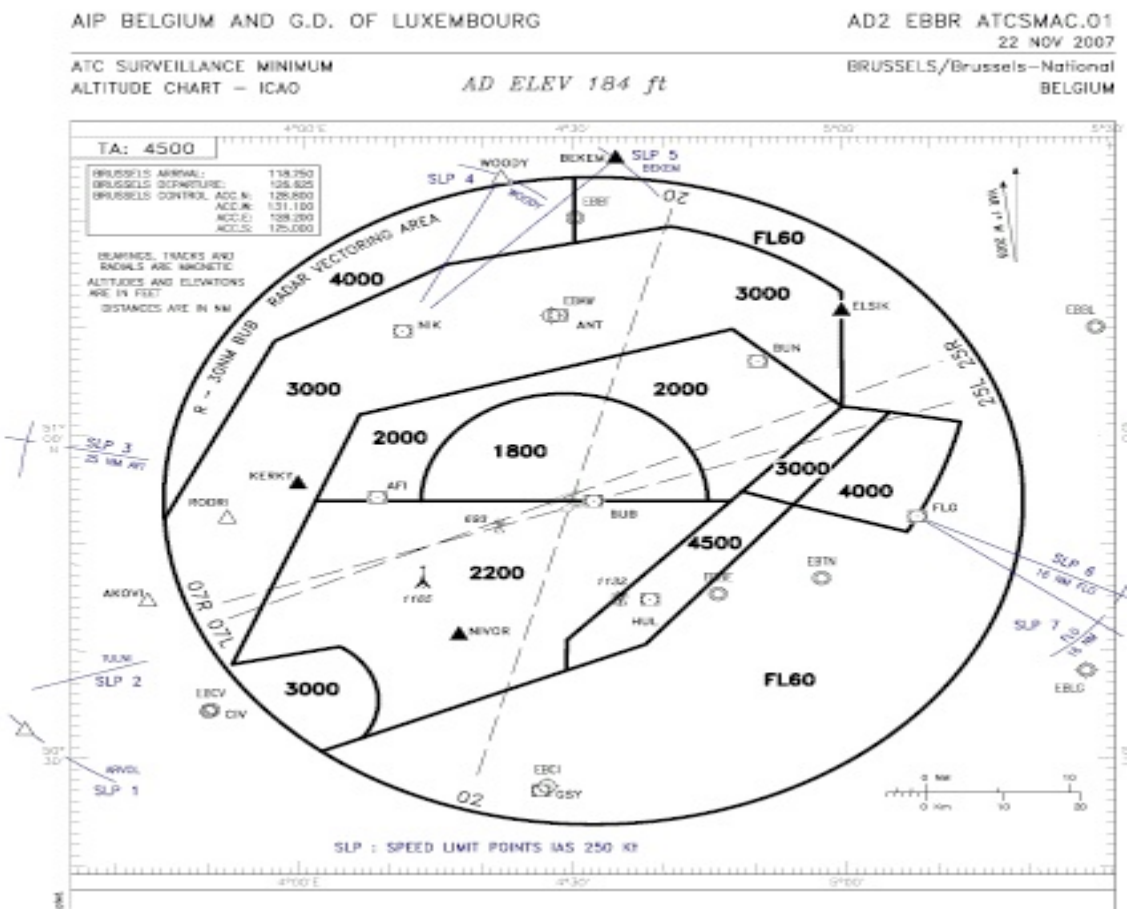
The MRVA is the lowest altitude or flight level that may be assigned by a radar controller to an IFR-aircraft.
It takes into account:

- - the minimum safe height (1000 ft) above the highest obstacle within a radius of 8 km
- - the airspace structure.

Clearances for altitudes/levels below the MRVA will usually only be given on published IFR procedures, e.g. ILS.
The following figure shows the MRVAs for Frankfurt (EDDF):



Altitudes are displayed in 100 ft. Hence ‘22’ means 2200 ft.
Values in brackets are to be used at cold temperatures. For EDDF that is from AIRAC cycle November to AIRAC cycle March.
MRVA charts may look different from country to country and its name may vary.
So in Belgium it is titled “ATC surveillance minimum”:



Delaying actions

In times of high traffic the approach controller may need to delay arriving aircraft to establish and maintain an optimized approach sequence or a safe separation.
This can be achieved for instance by the following measures:

- - Delaying radar vectors
- - Holding or
- - Speed management

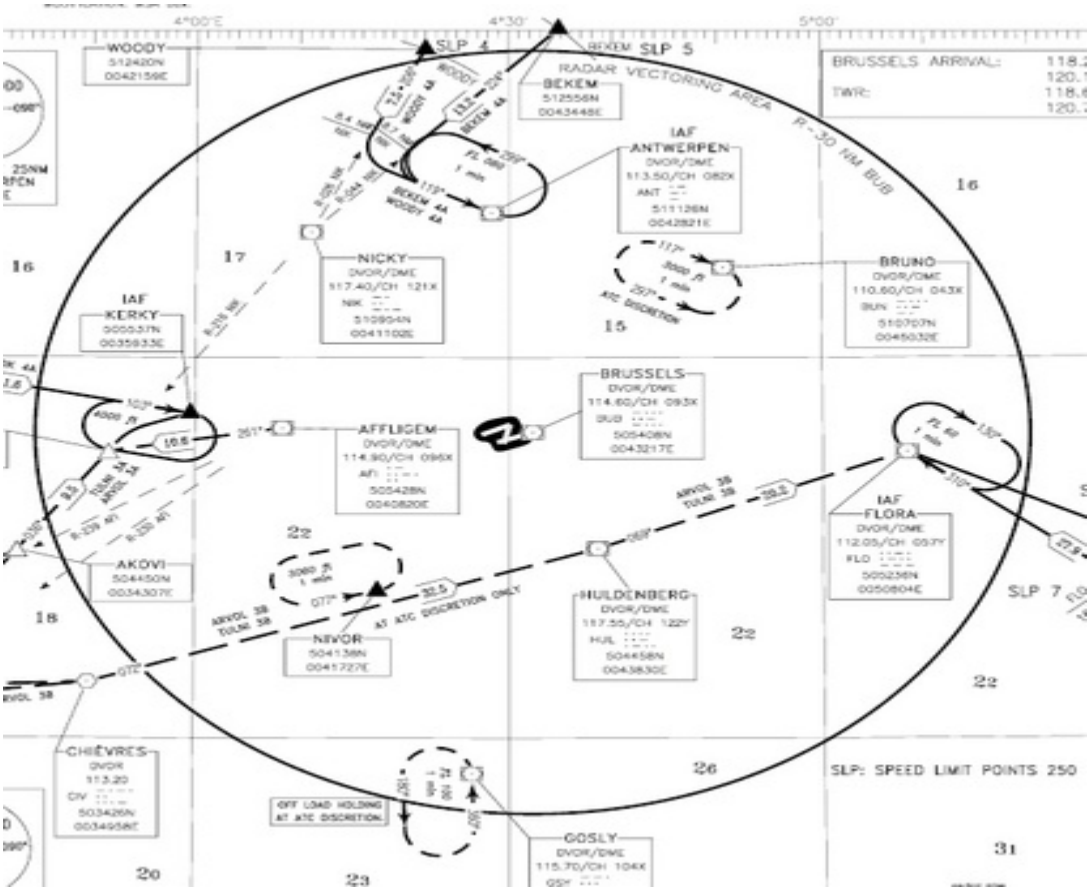
Delaying radar vectors

When the aircraft shall be delayed for a couple of minutes only, radar vectors for a little detour may be given to the pilot.
ATC has to consider separation and MRVA at any time!

Holding

Note: The radar controller should use the holding for delay purposes only in cases where the other measures aren't sufficient, since it is less flexible for ATC, burns more fuel, is uncomfortable for the passengers and strains the population below with additional noise.

Holdings are defined around every aerodrome which has published instrument approach procedures.
Usually a holding pattern is located at each initial approach fix (IAF).
The STAR (standard arrival route)-chart of an airport gives a good overview (here EBBR):



Nevertheless the radar controller may advise the pilot to fly a holding above every other way-point, fix or navigation aid, if necessary.

Holding elements

A Holding has a racetrack figure and contains the following elements:

- Fix (way-point, navigation aid, ...)
- Inbound leg
- Outbound turn: after passing the fix standard turn (3° per second) to the outbound leg
- Outbound leg: flown for a specified time; taking wind velocity and direction into account
- Inbound turn: standard turn to the inbound leg

Holding definition

A Holding is defined by:

- Fix (way-point, navigation aid, ...)
- Inbound course
- Turn direction
- Leg time (1 min. at or below 14000 ft; 1.5 min. above 14000 ft)

A holding with right turns is called ‘standard holding’; the one with left turns is a ‘non-standard holding’.

Holding instruction

The instruction for entering a holding shall comprise:

- Aircraft identification/call sign
- Holding fix (waypoint, navigation aid, DME value)
- Course of the inbound leg
- Leg time, if necessary

- Turn direction
- Altitude/flight level
- Expected further clearance time (EFC); in case of holding at the IAF: estimated approach time (EAT)

Note: Due to the different systems we use in IVAO (home computers connected at different places) EFC and EAT shall be given in "minutes from now".
Example: "EAT is in 8 minutes" rather than a clock time like in real life

Phraseology example:

"ABC123, HOLD OVER FLORA [VOR], INBOUND COURSE 310, RIGHT TURNS, DESCEND (AND MAINTAIN) FL 60, EXPECT FURTHER CLEARANCE IN 10 MINUTES."
In case ATC advises to enter a published holding:
"ABC123, HOLD OVER FLORA [VOR] AS PUBLISHED, DESCEND (AND MAINTAIN) FL 60, EXPECT FURTHER CLEARANCE IN 10 MINUTES."
Note: If considerable delay is expected, ATC may issue longer leg times than 1.5 minutes. This would make it more comfortable for the passengers

Holding stack

In periods of very high traffic it may be required that two or more aircraft hold above the same fix.
In this case ATC must consider:

- Approach sequence shall be kept unchanged. The aircraft that enters the holding at first, should leave it at first too.
- Aircraft must be separated vertically.
- Aircrafts may be advised to descend in the holding if necessary for succeeding approach.

Separation

An aircraft may be cleared to a level previously occupied by another aircraft **only** after the latter has reported vacating it, except when:

- severe turbulence is known to exist;
- the higher aircraft is effecting a cruise climb; or
- the difference in aircraft performance is such that less than the applicable separation minimum may result; in which case such clearance shall be withheld until the aircraft vacating the level has reported at or passing another level separated by the required minimum.

When the aircraft concerned are established in the same holding pattern, consideration shall be given to aircraft descending at markedly different rates and, if necessary, additional measures such as specifying a maximum descent rate for the higher aircraft and a minimum descent rate for the lower aircraft, should be applied to ensure that the required separation is maintained.
Application of radar separation between holding aircraft and other flights shall be subject to requirements and procedures prescribed by the appropriate ATS authority. These national regulations can be found on the websites of the respective IVAO division.
Radar separation shall **not** be applied between aircraft holding over the same holding point!

References:

http://academy.ivao.aero/node/88 ; ICAO Doc. 4444 chapter 6.5.5 ; ICAO Doc. 4444 chapter 12.3.3.3

Speed management

Speed management is a very effective and regular used technique to slow down aircrafts for separation purposes during approach.
Note: Speed restrictions shall be issued by ATC only if necessary for separation.
Speed restrictions may be given to an arriving aircraft in the form of:

- maximum speed
- minimum clean speed
- minimum speed

- specified speed in knots IAS (indicated airspeed)

Note: Minimum clean speed is the lowest possible speed for an aircraft in clean configuration (no flaps used).
It is good practice to keep an approaching aircraft as long as possible in clean configuration.
So ATC may advise: “ABC123, REDUCE TO MINIMUM CLEAN SPEED”
This however is often less optimal, since each arriving aircraft has its own minimum clean speed.
It is better to ask the pilot “ABC123, REPORT MINIMUM CLEAN SPEED” and thereafter advise a dedicated speed explicitly.
Important: Speed restrictions shall not be applied to aircraft after passing a point 4 NM before the threshold.

Validity of a speed restriction

A speed restriction is valid until it is specifically cancelled again by ATC.
A clearance to intercept the ILS does not cancel a given speed restriction!

That means: When using speed restrictions during initial or intermediate approach, the radar controller has to assign an adequate speed to the aircraft on final or cancel the restriction if no longer necessary!

Further remarks:

- Speed restriction less than 250 IAS to an aircraft on initial descent, just leaving cruise level, should only be advised with the concurrence of the flight crew.
- High rate of descent together with a speed restriction should be avoided since it exceeds aircraft capabilities
- On intermediate or final approach only minor speed restrictions of max. +/- 20 kts should be used.
- Frequent changes of the speed restriction should be avoided.
- No speed restrictions should be assigned to aircraft entering a holding or being already established in it.

Recommendation phraseology:

When transmitting messages containing flight levels each digit shall be transmitted separately. However, in an endeavour to reduce ‘level busts’ caused by the confusion between some levels (100/110, 200/220 etc.), levels which are whole hundreds e.g. FL 100, 200, 300 shall be spoken as “Flight level (number) HUNDRED”. The word *hundred* must not be used for headings.

Examples: Ref: ICAO Doc 4444, table A5-6
Note: Despite it is depicted in the Doc 4444 examples, the use of the word “TO” is not recommended, since it may be mixed up with the number “two” (2).

1) Two arriving aircraft. The second one needs to be delayed:

“ABC123, REDUCE SPEED 200 KNOTS OR LESS”
Note: “OR LESS” is unharmful for the separation since there is no aircraft behind, but it allows the pilot to reduce to final approach speed without a further clearance or restriction cancel from ATC.

2) Several aircraft approaching from different directions.

That one to be intended the first in sequence will be advised to maintain a specific speed to ensure it will reach the final at first:
“ABC123, MAINTAIN 250 KNOTS OR GREATER” or
“ABC123, INCREASE SPEED 250 KNOTS OR GREATER”
ATC may add a reason: “... TO BE NUMBER ONE”

3) Speed restriction no longer needed:

“ABC123, RESUME NORMAL SPEED”

4) Speed restriction not necessary:

Airspace classes D, E, F prescribe a speed restriction of 250 kts IAS for IFR flights below 10000 ft.
The radar controller may cancel this restriction:
“ABC123, NO SPEED RESTRICTION”

5) Speed restriction on final approach:

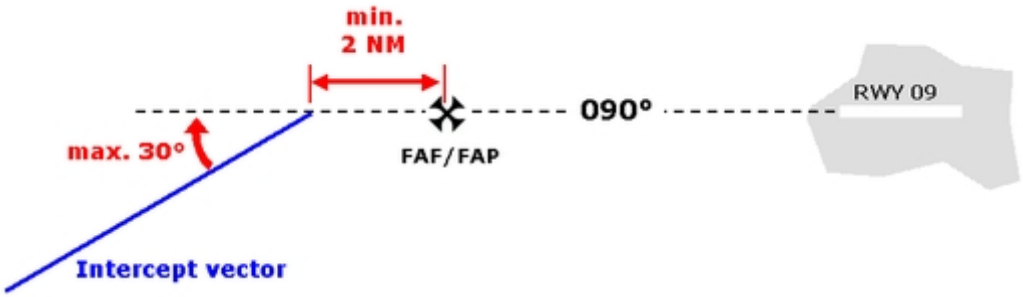
If it is necessary to issue a speed restriction on final approach, it should be limited to a point minimum of 4 NM from the threshold or at the outer marker (OM), prior to the hand-off to the tower.
“ABC123, REDUCE SPEED 170 KNOTS UNTIL DME 5” or “...UNTIL OUTER MARKER”
...Readback of the flight crew...
“ABC123, CONTACT TOWER ON xxx.xxx”
References: ICAO Doc 4444 chapter 4.6

Vectoring to pilot-interpreted final approach aid

The radar approach controller is responsible of supplying an arriving aircraft with vectors to the final approach. This may be an instrument (ILS, MLS, GPS, VOR, NDB, ...) or visual approach.

Vectoring for instrument approaches

If a specific instrument approach is prescribed for an airport or requested by a pilot the radar controller will guide the aircraft with vectors to the beginning of the final approach segment. In case of non precision approach (NPA) this would be the final approach fix (FAF) and in case of precision approach (PA) the final approach point (FAP).
The vector that is issued to the pilot to intercept the ILS localizer course or final approach track should allow him to intercept the localizer course/approach track at an angle of 30 degrees or less.
Furthermore this vector shall enable the aircraft to be established on localizer course/approach track for at least 2 NM before it has to start its descend.



The radar controller will let the aircraft descend usually to the altitude/level stated on the instrument approach chart (IAC) for that kind of approach.
A higher or lower altitude/level may be possible but it must be considered:

- MRVA
- a higher altitude requires to intercept the localizer course/approach track even prior to the FAF/FAP!

Rule of thumb: 1000 ft ~ 3 NM (for 3° glide slope).
The descend instruction shall be given in time to ensure at least 1 NM level flight before intercepting the localizer course/approach track.
The clearance for the approach should be issued in time before interception of the localizer course/approach track.
The aircraft shall be instructed to report when established on the final approach track.
“ABC123, cleared for ILS approach runway 09, report established”
Or
“ABC123, cleared for NDB approach runway 09, report established”

SEPARATION

The radar controller is responsible for maintaining the radar separation between succeeding aircraft on the same final approach!
This can be accomplished if necessary by delaying actions as depicted above in this article.
The national ATS authority may prescribe procedures that allow to transfer the responsibility to the aerodrome controller.
The radar controller may instruct the flight crew to follow and maintain own separation to the preceding aircraft.
For details see paragraph “vectoring for visual approach”.
Hint:
After an aircraft has received the clearance for an approach AND has become established on the final approach course (which means, that radar vectoring terminates at this point), the pilot may descend on own discretion to

the altitude stated on the IAC for that type of approach.

So if – for instance – the IAC for an ILS approach prescribes to intercept the glide slope at an altitude of 5000 ft but the radar controller issued the approach clearance (e.g. for separation reasons) in 6000 ft already, the pilot may start its descent to 5000 ft - whenever he likes - after he has become established on the localizer.
That however may cause trouble for the radar controller, since the separation could be endangered.
Hence it is good practice to advise the pilot to start descend not before reaching the glide slope:
“ABC123, TURN RIGHT HEADING 060, DESCEND ALTITUDE 6000 FT”
...Readback from the flight crew...
“ABC123, cleared for ILS approach runway 09, LEAVE 6000 ft on the glide, report established”
References:
ICAO Doc 4444 chapter 8.9.4
ICAO Doc 4444 chapter 6.7.3.2.3
ICAO Doc 4444 chapter 6.5.3.5

Vectoring for visual approach

Visual approaches may be applied in case of:

- No instrument approach defined or available
- Onboard IFR-equipment defective or unreliable
- Need for time savings

Prerequisites for a visual approach *

- Ceiling must be reported above the lowest usable vectoring altitude (MRVA).
- Weather conditions (e.g. visibility) have to be of that kind that the controller may expect that the landing can be performed safely and successful.
- It has to be coordinated with the tower controller.

An aircraft may be cleared for a visual approach after the pilot reported the aerodrome/runway or preceding aircraft in sight, thereafter radar service terminates usually.
Attention:
A visual approach does not cancel an IFR flight! Thus the radar controller is still responsible for the separation to and between other aircrafts!
For successive visual approaches (see visual approach requirements above *), the controller will instruct the pilot to follow and maintain own separation to the preceding aircraft after the crew has reported having the preceding aircraft in sight.
When both aircraft are of a heavy wake turbulence category, or the preceding aircraft is of a heavier wake turbulence category than the following, and the distance between the aircraft is less than the appropriate wake turbulence minimum, the controller shall issue a caution of possible wake turbulence. The pilot in command of the aircraft concerned shall be responsible for ensuring that the spacing from a preceding aircraft of a heavier wake turbulence category is acceptable. If it is determined that additional spacing is required, the flight crew shall inform the ATC unit accordingly, stating their requirements.

How to handle a visual approach:

If an aircraft requests a visual approach, the controller will:

- check the weather conditions
- verify that the other arrival (and departure) traffic allows a vis app.
- coordinate with tower controller
- inform the crew that they may expect vis app.
- send the aircraft as direct as possible – concerning the aircraft’s position and the other traffic – in direction of the intended runway threshold or the downwind.
- let the aircraft descend to the lowest possible altitude/flight level above MRVA.

Transfer of communications to the aerodrome controller should be effected at such a point or time that information on essential local traffic, if applicable, and clearance to land or alternative instructions can be issued to the aircraft in a timely manner.

Phraseology examples (Readbacks omitted):

“MUENCHEN RADAR, ABC123, GOOD DAY, REQUEST VISUAL APPROACH RUNWAY 26R”
“ABC123, MUENCHEN RADAR, HELLO. ROGER, STAND BY”
If visual approach is possible:
“ABC123, GOOD NEWS, FLY HEADING 240, DESCEND ALTITUDE 4000 FT, QNH..., EXPECT VISUAL APPROACH RUNWAY 26R, REPORT RUNWAY IN SIGHT ”
”RUNWAY IN SIGHT, ABC123 ”
“ABC123, CLEARED FOR VISUAL APPROACH RWY 26R, (REPORT JOINING DOWNWIND, FINAL….) ”
In case the aircraft shall maintain own separation from preceding aircraft:
“ABC123, PRECEDING TRAFFIC, A320, 12 O’CLOCK, 8 NM, REPORT IN SIGHT”
“, ABC123 PRECEDING TRAFFIC IN SIGHT”
“ABC123, MAINTAIN OWN SEPARATION (FROM MENTIONED TRAFFIC-CAUTION WAKE TURBULENDE IF APPLICABLE), CLEARED VISUAL APPROACH RWY 26R (REPORT JOINING DOWN WIND, FINAL….)”
...Readback from the flight crew...
” ABC123, JOINING DOWNWIND (ON FINAL….) RWY 26R ”
“ABC123, CONTACT TOWER ON 118.7, BYE ”
References:
ICAO Doc 4444 chapter 8.9.5

Navigation assistance included Assistance to VFR flights

Assistance

In case the radar controller observes that an identified aircraft deviates significantly from its intended route or holding pattern he will give advises accordingly.
If a pilot requests navigation assistance from a radar controller he shall state the reason. E.g. avoiding areas of adverse weather, unreliable navigational instruments, etc.
Reference:
ICAO Doc 4444 chapter 8.6.6

Strayed VFR flights

[Rem.: only the IVAO relevant information mentioned here!]

Definition:

An aircraft is regarded strayed when it has deviated significantly from its intended track or if it reports that it is lost.
Important:
Generally, action must be taken when providing navigation assistance to ensure that the aircraft does not enter cloud.
If a VFR aircraft is strayed or encountering adverse weather conditions it should be considered to be in a state of EMERGENCY and handled as such!
In this case the controller should communicate in clear, concise and calm manner.
Care should be taken not to ask the pilot for possible faults in his preparation or conduction of the flight.
Depending on the circumstances the pilot should be requested to provide any of the succeeding information if considered helpful in this situation:

- aircraft flight conditions;
- position and level, if known;
- airspeed and heading since last known position;
- pilot experience;
- navigation equipment on-board and if any nav-aid signals are being received;
- SSR mode and code selected;
- departure and destination aerodromes;
- number of persons on board;
- endurance.

Navigation assistance to help the pilot determine the aircraft position may be provided by use of radar, navigation aids or sighting by another aircraft.
The pilot should be provided with reports and information on suitable airports in the vicinity where VMC conditions exist.

If the pilot reports difficulties with maintaining VMC, he shall be informed of the minimum flight altitude of his area. In case the aircraft is below this level, measures – e.g. advise track, heading or climb – should be taken to bring the aircraft back to safe level.
Radar assistance to VFR should only be provided upon pilot's request.
When providing radar assistance in adverse weather conditions the primary objective should be to bring the aircraft back to VMC.
Provided the circumstances are of a kind that the pilot cannot avoid IMC:

- turns by the aircraft should – whenever possible – performed clear of cloud;
- instructions involving abrupt maneuvers should be avoided;
- instructions or suggestions to reduce speed or lower the landing gear should – as far as possible – carried out clear of cloud.

Reference:
ICAO Doc 4444 chapter 15.3.1

Collision hazard information. ACAS procedures including official ICAO phraseology in case of RA (resolution advisory)

The Aircraft Collision Avoidance System (ACAS) or Traffic alert and Collision Avoidance System (TCAS) does generate Resolution Advisories (RA) autonomously to avoid conflictions between airborne aircrafts.
Pilots are obliged to follow these immediately, even if they get contrary directives from the radar controller!
Hence ICAO issued rules how to deal with such a situation.
When a pilot reports following a TCAS RA, the controller shall not attempt to modify the aircraft's flight path until the pilot reports returning to the latest ATC instruction or "clear of conflict".
The controller in this case may issue traffic information if appropriate.
The controller's responsibility for separation ends – for all involved aircrafts – when the aircraft departs from its clearance in order to comply to a RA.
The separation responsibility resumes when:

- the flight crew reports resuming the latest ATC clearance, or
- the flight crew acknowledges an alternative ATC clearance after resuming the latest clearance.

Phraseology

When the flight crew gets a TCAS/ACAS RA, they will inform the controller accordingly:
"ABC123,...TCAS CLIMB [or DESCENT]..."
followed by acknowledgement from ATC.
After TCAS issued a "Clear of Conflict" message the pilot reports:
"ABC123,...RETURNING TO [former clearance]..."
followed by acknowledgement or alternative instructions from ATC.
Both may be combined:
"ABC123,...TCAS CLIMB [or DESCENT], RETURNING TO [former clearance].."

Emergencies.

It is what the pilot determines. It is what the pilot declares. It is what the pilot decides that the state of the aircraft is.

There are many factors and different circumstances that determine whether an urgency or an emergency exists or not.

An engine failure with a four-engine aircraft is very different from an engine failure of a single-engine aircraft. Therefore in general, it is the pilot in command who decides, what he thinks that the situation is for his aircraft in his situation: A minor failure, an urgency or an emergency.

Two states of emergency

a) Distress:

A condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.

Examples : ditching, crash landing imminent, total engine failure...

b) Urgency:

A condition concerning the safety of an aircraft or some persons on board but which does not required imediate assistance.

Examples : lost, fuel shortage, partial engine failure, navigation system failure...

PAN PAN - Urgency handling

Urgency:

A condition concerning the safety of an aircraft or some persons on board but which does not required immediate assistance.
Examples : lost, fuel shortage, partial engine failure, navigation system failure...
If a pilot finds himself in such a situation, obviously het will have to announce this.
Therefore he will sent a emergency announce message, called

Urgency Message:

“Pan Pan, Pan Pan, Pan Pan”, (3 times pan pan)

“this is [aircraft call sign]
then transmit as many of the following elements as necessary and as time permits :
- aircraft position and heading
- flight level, altitude or height
- aircraft type and POB (number of persons on board)
- nature of urgency
- intentions and abilities or limitations
- any other relevant piece of information (weather, endurance, intentions...)
Normally in this case the transponder squawk remains as before, since this is not an emergency.

Urgency cancellation

When an aircraft is no longer in a state of urgency, a cancellation message shall be transmitted on the frequencies used for the (original) urgency message.

MAYDAY MAYDAY MAYDAY - Emergency handling

Distress:

A condition of being threatened by serious and/or imminent danger and of requiring immediate assistance.
Examples : ditching, crash landing imminent, total engine failure...
If a pilot finds himself in such a situation, obviously he will have to announce this. That is called that he "declares" an emergency. Only then ATC can allow the necessary priority.
Therefore the pilot have to sent an Emergency announce message, called

Distress Message:

“Mayday, Mayday, Mayday”, (3 times mayday)

“this is [aircraft call sign]”
then transmit as many of the following elements as necessary and as time permits :
- aircraft position and heading
- flight level, altitude or height
- aircraft type and POB (number of persons on board)
- nature of emergency
- intentions and abilities or limitations
- any other relevant piece of information (weather, endurance, intentions...)

If the pilot is unable to send any radio message at that time, he can and should try to set his transponder to squawk 7700.
IN IVAO it is recommended to squawk 7700 in any case of declared emergency.

Emergency radio frequency and squawk code

The procedure in this situation is:
* if under radar control (in contact with ATC), use the active frequency to declare the emergency
* in other situations, squawk 7700 and transmit your message on 121.500 (GUARD)

Note: GUARD is the common emergency frequency in general ONLY used by pilots in emergency or urgency situations.

Emergency cancellation

When an aircraft is no longer in emergency, a cancellation message shall be transmitted on the frequencies used for the (original) emergency message and the squawk shall be reset not to squawk 7700 anymore.

Radio Failure Procedures

Radio failure

In the Flight Simulation world, we could consider a Teamspeak (TS) breakdown as a radio failure. However, you should be able to contact the controller on text mode via IvAp on the ATC frequency or with the <.msg> command.
But if, for any reason, both voice and text modes are inoperative, here is what you can do.

a) IFR :

- Squawk 7600 (if equipped)
- If VMC, maintain VMC and land at the nearest suitable airport.

Note that in real life, you should report your arrival to the appropriate ATC unit as soon as possible after landing. In IVAO, let's say you will try to fix your problem (connection, RW IP...) and advise the controller when the situation is back to normal

- If unable to descend and land in VMC:
* proceed according to your flightplan and regulate your flight in order to land at the estimated time of arrival (ETA).
(example: take off (ATD) was at 20:38z and indicated total estimate elapsed time (EET) in your flight plan is 2h10min, than your estiamted time of arrival (ETA) will be 22:48z).
* if having received ATC instructions, follow those last received instructions and when reaching the clearance limit, resume the flight according to your flight plan as above.
* if under approach control, follow last ATC instructions (or see paragraph c below) then execute a published instrument approach procedure.

b) VFR :

- Squawk 7600 (if equipped)
- Maintain VMC and land at the nearest suitable airport.

Note that in real life, you should report your arrival to the appropriate ATC unit as soon as possible after landing. In IVAO, let's say you will try to fix your problem (connection, RW IP...) and advise the controller when the situation is back to normal.

c) Approach charts:

- If any, follow the instructions indicated on instrument or visual approach charts.

Note: Communication failure.

It could happen that a communication failure only exist in one way. Aircraft cannot transmit, but can receive voice. In an earlier chapter the voice-text procedure had been described. (See Text-Voice Communications and Text-voice Abbreviations)

d) One way communication

How to find out that there exist a one-way communication? Ask the pilot to squawk ident in case he reads your message. Another more traditional way is by instructing a particular heading (e.g 30 degrees to the right) and after observation, instruct again a turn back (e.g. 30 degrees to the left). If the aircraft you believe is the one in communication failure follows your instructions, you may safely assume control.

In all cases of communication failure, make sure other aircraft are well separated taking in account unexpected manoeuvring of the communication failure aircraft.