Arrival Procedures & STARs

What is a STAR.

A **Standard Terminal Arrival Routes**, STAR, is a flight route defined and published by the air navigation service provider that usually covers the phase of a flight that lies between the last point of the route filled in the flight plan and the first point of the approach to the airport, normally the initial approach fix (IAF). Hence, a STAR connects the enroute phase with the approach phase of the flight.

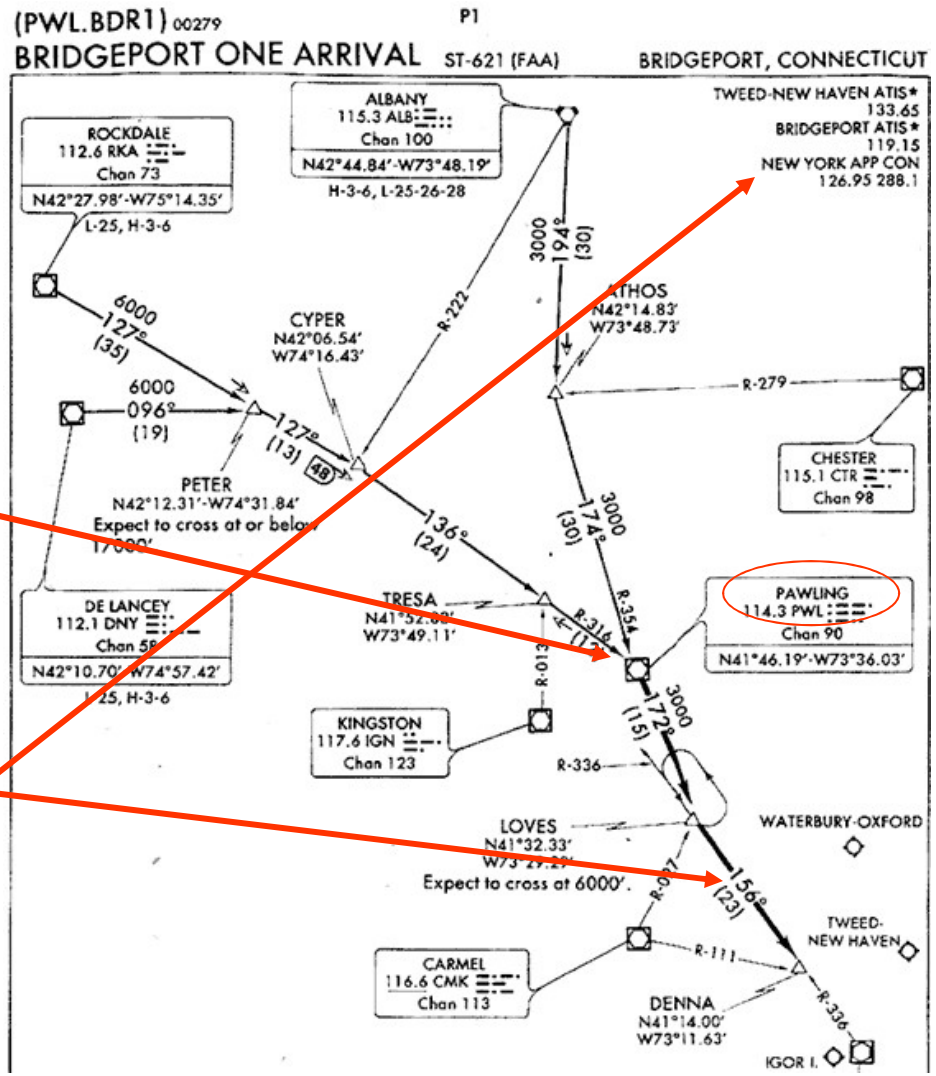
A typical STAR consists of a *set* of starting points, called *Transitions*, and a description of routes (typically via VORs and intersections) from each of these transitions *to a point* ***near*** *a destination airport*, upon reaching which the aircraft can join an instrument approach (IAP) or be vectored for a final approach by terminal air traffic control.

Standard Terminal Arrival Routes (STARS)

- Established primarily to simplify clearance delivery procedures
- Designed to simplify the transition from enroute phase to the approach phase
  - Plan your route to end at the transition fix of a STAR, if applicable
  - Flight plan designation of a STAR is reverse of that used for a *Departure Procedure* (DP)
    - DP: <DP name>.<transition> from airport to transition point
    - STAR: <transition>.<STAR name> from enroute segment to point ***near the airport***.

Standard Terminal Arrival Routes (STARS)

- Interpreting STARs
  - The main part of a STAR *begins*
    - at a navaid or intersection
    - where all arrival transitions join
  - Arrival route headings (NOS)
    - are depicted by large numerals
    - and heavyweight lines
  - Approach control frequencies are found in the corner of the STAR



Standard Terminal Arrival Routes (STARS)

RAMMS ONE ARRIVAL (RAMMS.RAMMS1)

VERTICAL NAVIGATION PLANNING INFORMATION

Expect clearance to cross Ramms Int at 250 Kt or slower and at or below 17000'.

TRANSITIONS

Alpoe (ALPOE.RAMMS1): From Alpoe Int to Ramms Int: Via GLL R-276 to Autim Int, then via DVV R-311. Thence

Cheyenne (CYS.RAMMS1): From CYS VOR to Ramms Int: Via CYS R-203 to Elkee Int, then via DVV R-311. Thence

Medicine Bow (MBW.RAMMS1): From MBW VOR to Ramms Int: Via MBW R-147 to Autim Int, then via DVV R-311. Thence

ARRIVAL

From over Ramms Int via the DVV R-311 to Prong Int. Expect radar vectors to the final approach course at or before Prong Int.

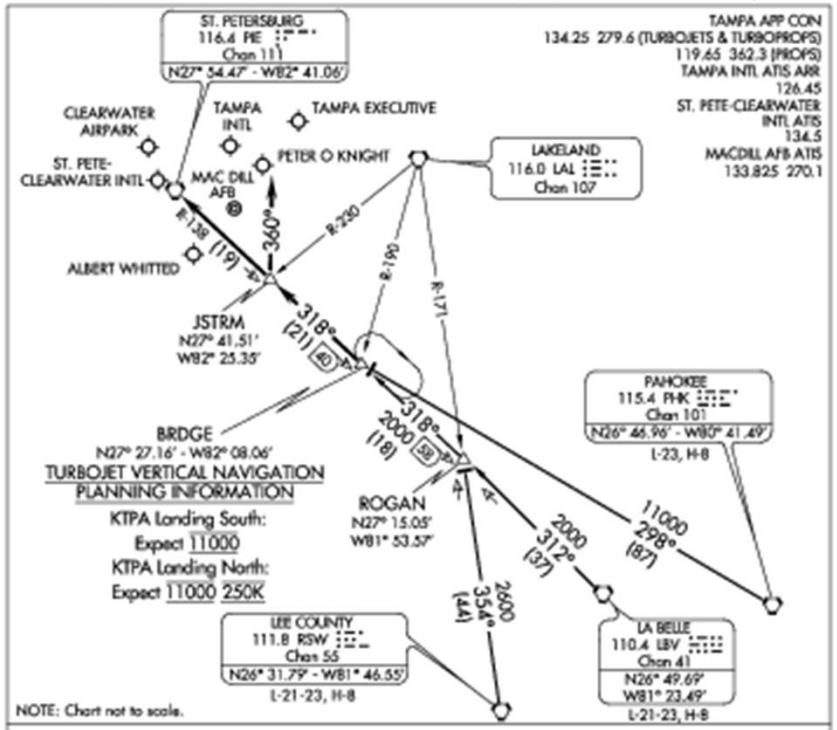
Vertical navigation planning is intended to help turbojet and turboprop aircraft plan power settings and configurations that will result in an efficient descent with regards to fuel, time, and engine wear.

(BRDGE.BRDGE7) 14093

BRDGE SEVEN ARRIVAL

ST-416 (FAA)

TAMPA, FLORIDA



SE-3, 23 JUL 2015 to 20 AUG 2015

SE-3, 23 JUL 2015 to 20 AUG 2015

ARRIVAL ROUTE DESCRIPTION

LA BELLE TRANSITION (LBV.BRDGE7): From over LBV VORTAC on LBV R-312 & PIE R-138 to BRDGE INT. Thence. . . .

LEE COUNTY TRANSITION (RSW.BRDGE7): From over RSW VORTAC on RSW R-354 to ROGAN INT, then via PIE R-138 to BRDGE INT. Thence. . . .

PAHOKEE TRANSITION (PHK.BRDGE7): From over PHK VORTAC on PHK R-298 to BRDGE INT. Thence. . . .

KTPA:

. . . .RWY 19L/R: From over BRDGE INT on PIE R-138 to JSTRM INT. Depart JSTRM INT heading 360° for vector to final approach course.

. . . .RWY 01L/R: From over BRDGE INT on PIE R-138 to PIE VORTAC. Expect radar vector to final approach course after BRDGE INT.

KPIE, KCLW, KTPF, KSPG, KMCF, KVDF:

. . . .From over BRDGE INT on PIE R-138 to PIE VORTAC. Expect radar vector to final approach course/airport after BRDGE INT.

LOST COMMUNICATIONS: STANDARD.

BRDGE SEVEN ARRIVAL

TAMPA, FLORIDA

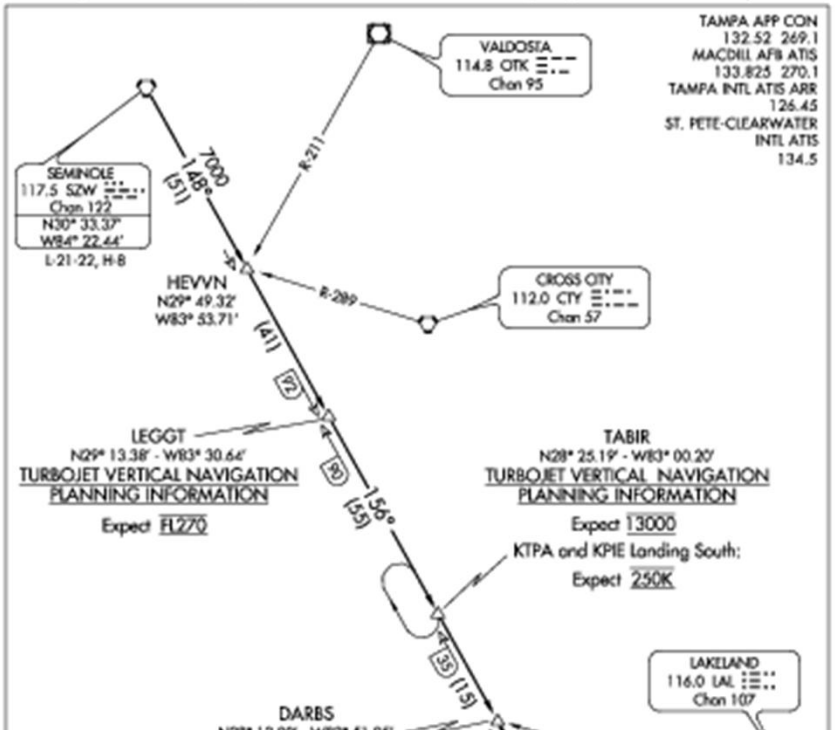
(BRDGE.BRDGE7) 14093

(DARBS.DARBS3) 14093

DARBS THREE ARRIVAL

ST-416 (FAA)

TAMPA, FLORIDA



SE-3, 23 JUL 2015 to 20 AUG 2015

SE-3, 23 JUL 2015 to 20 AUG 2015

ARRIVAL ROUTE DESCRIPTION

SEMINOLE TRANSITION (SZW.DARBS3): From over SZW VORTAC on SZW R-148 and PIE R-336 to DARBS INT. Thence....

....From over DARBS INT on PIE R-336 to PIE VORTAC. Expect radar vectors to final approach course.

LOST COMMUNICATIONS: STANDARD.

DARBS THREE ARRIVAL

TAMPA, FLORIDA

(DARBS.DARBS3) 14093

(FOOXX.FOOXX4) 14037 ST-416 (FAA)

FOOXX FOUR ARRIVAL (RNAV)

TAMPA, FLORIDA

TAMPA APP CON
132.52 269.1
TAMPA INTL ATIS ARR
126.45
ST. PETE-CLEARWATER INTL ATIS
134.5
MACDILL AFB ATIS
133.825 270.1
TAMPA EXECUTIVE AWOS-3
121.125

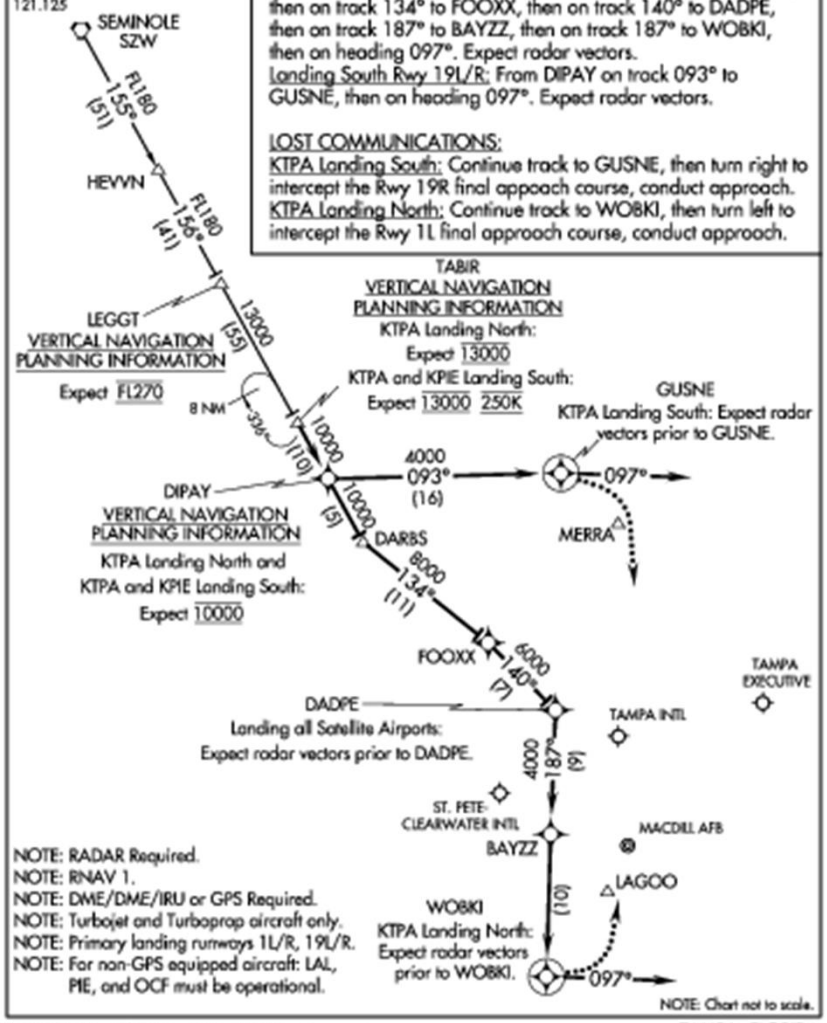
ARRIVAL DESCRIPTION

SEMINOLE TRANSITION (SZW.FOOXX4):

From TABIR on track 156° to DIPAY.

Landing North Rwy 1L/R: From DIPAY on track 156° to DARBS, then on track 134° to FOOXX, then on track 140° to DADPE, then on track 187° to BAYZZ, then on track 187° to WOBKI, then on heading 097°. Expect radar vectors.
Landing South Rwy 19L/R: From DIPAY on track 093° to GUSNE, then on heading 097°. Expect radar vectors.

LOST COMMUNICATIONS:
KTPA Landing South: Continue track to GUSNE, then turn right to intercept the Rwy 19R final approach course, conduct approach.
KTPA Landing North: Continue track to WOBKI, then turn left to intercept the Rwy 1L final approach course, conduct approach.



NOTE: RADAR Required.
NOTE: RNAV 1.
NOTE: DME/DME/IRU or GPS Required.
NOTE: Turbojet and Turboprop aircraft only.
NOTE: Primary landing runways 1L/R, 19L/R.
NOTE: For non-GPS equipped aircraft: LAL, PIE, and OCF must be operational.

NOTE: Chart not to scale.

SE-3, 23 JUL 2015 to 20 AUG 2015

FOOXX FOUR ARRIVAL (RNAV)
TAMPA, FLORIDA
(FOOXX.FOOXX4) 14037

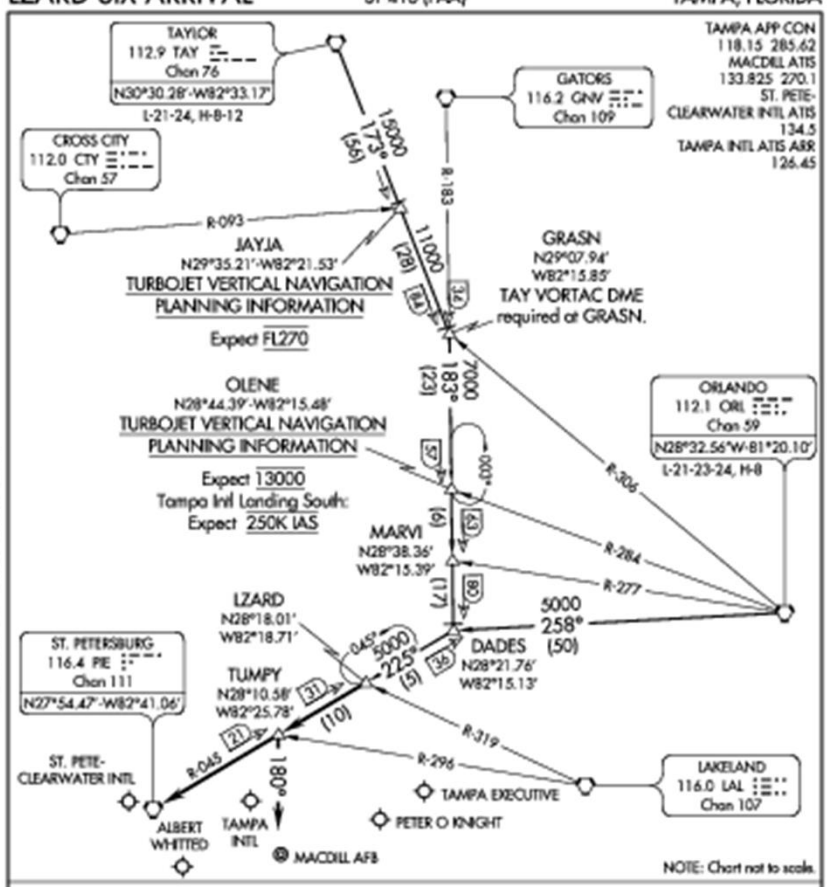
(LZARD.LZARD6) 14093

LZARD SIX ARRIVAL

ST-416 (FAA)

TAMPA, FLORIDA

TAMPA APP CON
118.15 285.62
MACDILL ATIS
133.825 270.1
ST. PETE-
CLEARWATER INTL ATIS
134.5
TAMPA INTL ATIS ARR
126.45



NOTE: Chart not to scale.

TAYLOR TRANSITION (TAY.LZARD6): From over TAY VORTAC on TAY R-173 to GRASN INT, then on GNV R-183 to DADES INT, then on PIE R-045 to LZARD INT. Thence...
ORLANDO TRANSITION (ORL.LZARD6): From over ORL VORTAC on ORL R-258 to DADES INT, then on PIE R-045 to LZARD INT. Thence...
TAMPA INTL:
....RWY 1L/R: From over LZARD INT on PIE R-045 to TUMPY INT. Depart TUMPY INT heading 180° for radar vectors to final approach course.
....RWY 19L/R: From over LZARD INT on PIE R-045 to PIE VORTAC. Expect radar vectors to final approach after LZARD INT.
ALL OTHER AIRPORTS: From over LZARD INT on PIE R-045 to PIE VORTAC. Expect radar vectors to the airport after LZARD INT.

SE-3, 23 JUL 2015 to 20 AUG 2015

LZARD SIX ARRIVAL
TAMPA, FLORIDA
(LZARD.LZARD6) 14093

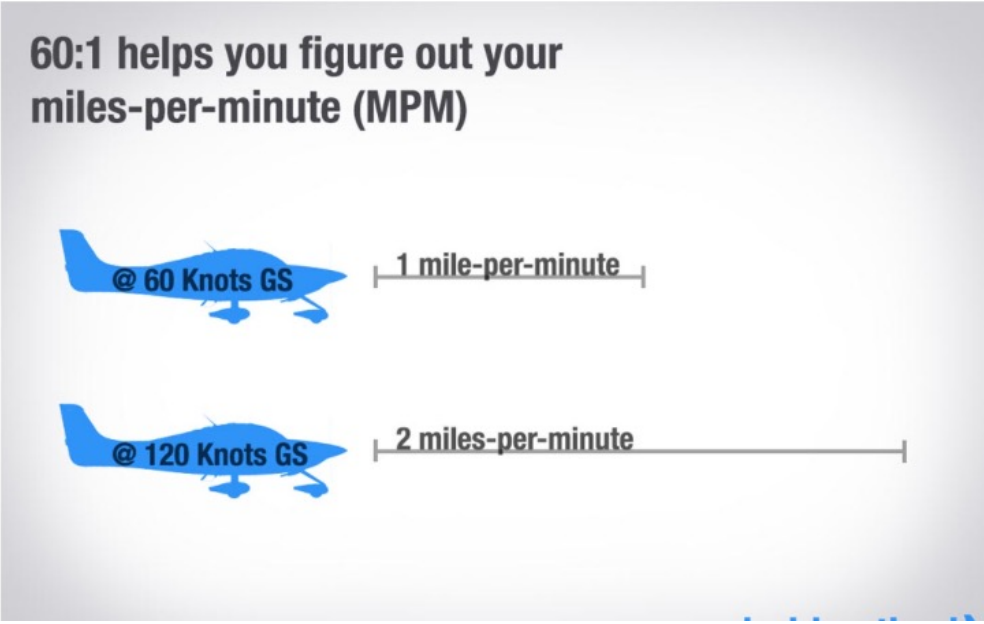
Descent Planning

Created by Steve Reisser

Starting With The Basics

There are a few basic things you need to understand to use the 60:1 rule.

- If you travel at 1 knot, you'll cover 1 nautical mile (NM) in 1 hour
- 1 hour contains 60 minutes
- If you travel at 60 knots, you'll cover 1 NM in 1 minute (which is 1 mile-per-minute, or 1 MPM)



Figuring out how many miles you're traveling each minute is really the key. Here are some examples that will help you down the road in this article, as well as the next time you fly.

Remember, these speeds are **ground speed**

When it comes to figuring out your MPM, ground speed is the only speed that matters.

- 60 knots = 1 MPM
- 90 knots = 1.5 MPM
- 120 knots = 2 MPM
- 150 knots = 2.5 MPM
- 180 knots = 3 MPM

Back To Our Descent Planning

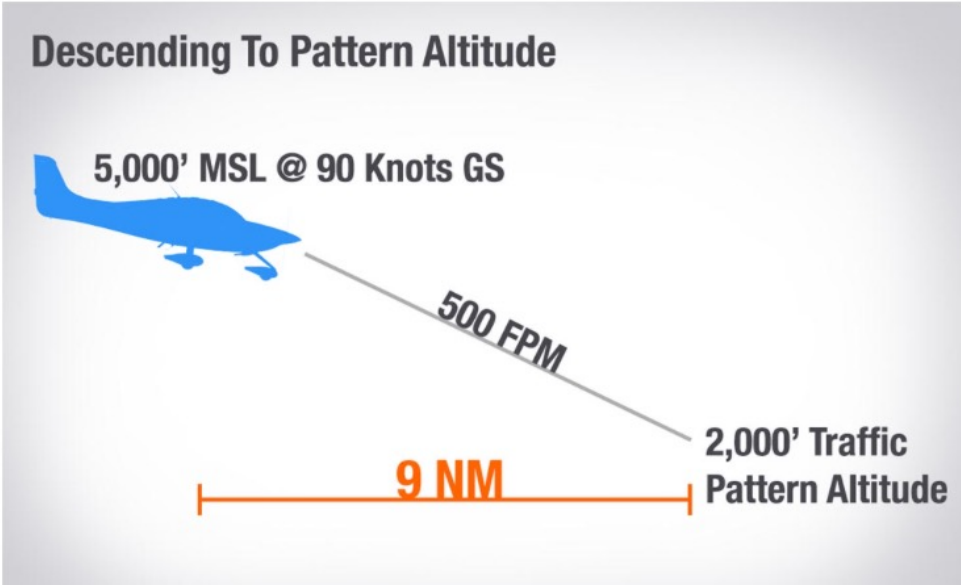
Now that we have the miles-per-minute stuff out of the way, lets get back to those descent planning questions.

In the first question, we had to descend from 5,000' to pattern altitude at 2,000', for a total of 3,000' of descent. We planned to descend at 500 FPM. And we need to figure out how many miles out from the airport we need to start that descent.

Step 1: First, we need to figure out how many minutes it's going to take us to descend, and that's pretty straight forward. If we need to descend 3,000', and we're doing it at 500 FPM, we divide 3,000 by 500, and we get 6 (3000/500 = 6). **It will take us 6 minutes to descend to pattern altitude**.

Step 2: Next, we need to figure out how many miles away from the airport we need to start that descent.

Since we're traveling at 90 knots ground speed, it means we're traveling 1.5 miles per minute (MPM). Now all we need to do is multiply our MPM by the number of minutes we need to descend, which was 6. So we'll multiply 1.5 X 6, which gives us 9 NM. **We need to start our descent 9 NM out to make it to 2,000' at the airport**.



Keep in mind, much like the pattern altitude example, this calculation will put you *right at the fix* at your crossing restriction altitude. It also doesn't account for increased ground speed in the descent. So in this example, it would probably be a good idea to add an extra 100-200 FPM to your descent rate to make sure you get down in time.

Descent Planning Any Pilot Can Use

It doesn't matter if you're a VFR pilot or IFR pilot, the 60:1 rule makes descent planning easy.

Whether you're trying to impress your passengers with a smooth descent to the airport, or you're trying to make sure you meet an altitude restriction with ATC, the 60:1 rule takes the guesswork out of descending, and makes you look like a pro.

Meeting The IFR Crossing Restriction

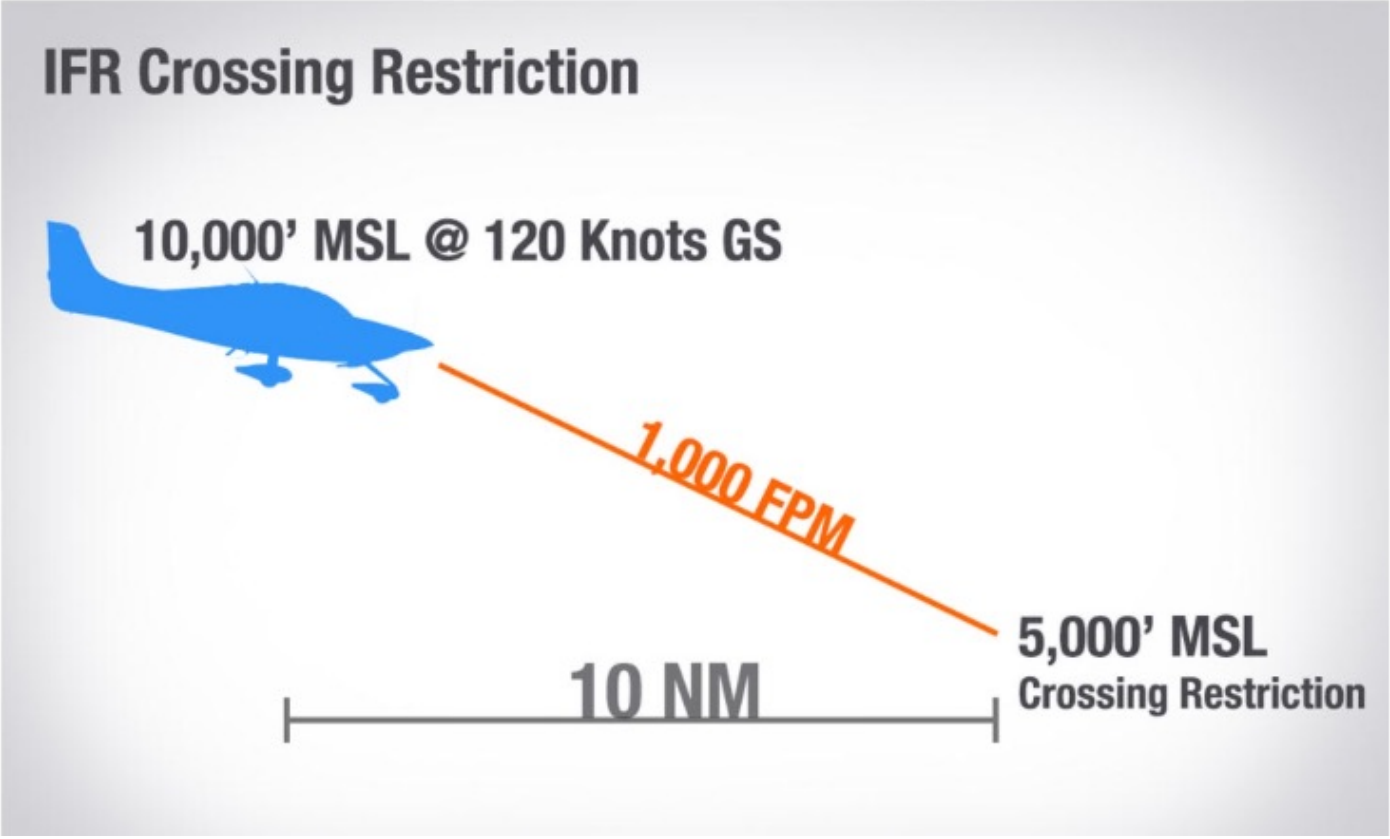
Now let's look at our second descent planning question.

We're at 10,000' MSL, and ATC gives us a crossing restriction of 5,000' for a fix that's 10 miles ahead of us. And we're flying at 120 knots ground speed.

Step 1: Our first step is to figure out how much altitude we need to lose. This is pretty easy. We're at 10,000', and we need to get to 5,000', so 10,000-5,000 = 5,000'. **We need to lose 5,000 feet**.

Step 2: Our next step is to figure out how long we have before we reach the fix. Since we're flying at 120 knots ground speed, we know we're going 2 MPM. With the fix 10 miles out, we'll divide 10 miles by 2 MPM and get 5 minutes (10/2 = 5). So in this scenario, **we have 5 minutes to the fix**.

Step 3: To finish things off we'll take the altitude we need to lose (5,000'), and divide it by the minutes to the fix (5). 5,000 feet / 5 minutes = 1,000 FPM. **We'll need to descend at 1,000 FPM to make the crossing restriction**.



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Standard Terminal Arrival Routes (STARS)

In order to determine the DISTANCE required to make a standard descent rate of 500 fpm, use the following formula:

Altitude / 1000 GS(kts) / 60 1000 / descent rate

Alt. to lose (1000s of feet) * Estimated Ground speed (miles/min) * minutes to descend 1000 feet (based on fpm descent (1000/500)

Example:

You are at 10,000 ft. inbound on a STAR and have to cross an intersection at 6,000 ft. When do you begin to descend? (Assume GS is 120 Kts, 500 fpm)

(minutes to descend 1,000 feet)

(10 - 6) * (120/**60**) * (1000/500) =

(miles/min)

4 * 2 * 2 = 16 NM before intersection

Preparing for the Arrival

- Remember: ATC can issue a STAR...
  - Without the pilot's request
  - as long as you have *not* indicated 'no STAR'
  - in the remarks section of your flight plan
- Know what approach to expect…
  - Listen to the ATIS, ASOS, AWOS
  - ask permission to contact the UNICOM or FSS
- Thoroughly review the approach procedure

Arrival Charts
Summary Checklist

- Standard Terminal Arrival Routes (STARs) Provide a standard method for leaving the enroute structure and entering a busy terminal area (airport).
- STARs are grouped along with other airport charts in Jeppesen subscriptions, and appear in the front of NACO booklets. Legends are found in the front of the corresponding book.
- If you accept a STAR, you must have at least a textual description of the procedure in your possession. A graphic description if preferable and easier to visualize.
- Writing “No STAR” in the remark section of your flight plan will alert ATC that you do not wish to use these procedures during the flight. You also may refuse a clearance containing a STAR, but avoid this practice if possible.
- STARs use symbology that is similar to that on graphic DPs. Altitudes are giving in reference to MSL, and distances in nautical miles.
- A STAR begins at a navaid or intersection where all arrival transitions begin.
- STARs are named according to the point where a procedure begins.
- Arrival route headings on a NACO STAR are depicted in large numerals within a heavyweight line wile Jeppesen STARS are abbreviated with **hdg** next to heading in degrees.
- Frequencies on which to contact A/C are found in the corner of NACO charts.
- Vertical Navigation planning information is given for pilots of turbo/jet traffic.

Arrival Procedures: Summary Checklist

- ATC may assign a STAR at any time, and it is your responsibility to accept or refuse the procedure.
- Altitudes and airspeeds published on the STAR are not considered restrictions until verbally give by ATC as part of a clearance.
- After receiving the arrival clearance, certain tasks can be completed before starting your approach, including gathering weather information and accomplishing the descent and approach checklists.
- After you determine the approach in use, review the appropriate chart and create a plan of action.
- A *Descend Via Clearance* instructs you to follow the altitudes published on the STAR, with descent at your discretion.
- ATC may issue a descent clearance which includes a crossing altitude. Comply by estimating the distance and rate of descent required.
- Expect to make airspeed adjustments as required by ATC. Responsibility for complying with **FAR 91.117** is up to the pilot in command.

FAR 91.117 Aircraft speed.

(a) Unless otherwise authorized by the Administrator, no person may operate an aircraft below 10,000 feet MSL at an indicated airspeed of more than 250 knots (288 m.p.h.).

(b) Unless otherwise authorized or required by ATC, no person may operate an aircraft at or below 2,500 feet above the surface within 4 nautical miles of the primary airport of a Class C or Class D airspace area at an indicated airspeed of more than 200 knots (230 mph.). This paragraph (b) does not apply to any operations within a Class B airspace area. Such operations shall comply with paragraph (a) of this section.

(c) No person may operate an aircraft in the airspace underlying a Class B airspace area designated for an airport or in a VFR corridor designated through such a Class B airspace area, at an indicated airspeed of more than 200 knots (230 mph).

(d) If the minimum safe airspeed for any particular operation is greater than the maximum speed prescribed in this section, the aircraft may be operated at that minimum speed.